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UNITED STATES DEPARTMENT OF AGRICULTURE
BULLETIN No. 772
Contribution from the Bureau of Plant Industry
WM. A. TAYLOR, Chief

Washington, D. C. PROFESSIONAL PAPER March 20, 1920

THE GENERA OF GRASSES OF THE UNITED STATES

WITH SPECIAL REFERENCE TO THE ECONOMIC SPECIES

By

A. S. HITCHCOCK, Systematic Agrostologist

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SCOPE AND PLAN OF THE WORK.

The present bulletin describes all the genera of grasses that include species that are native, have been introduced, or are cultivated in the United States. Under each genus are given the species that are of economic importance, either as useful or harmful grasses. Of all grasses the grains are of the greatest importance. Chief among other useful grasses are those that are cultivated for meadow or pasture and those indigenous species which furnish forage upon the native pasture or ranges. Other important grasses are the sugar-producing species, those used in broom or paper making, and the ornamental species.

It is intended to give under each genus the botanical information concerning all our grasses that are conspicuous enough to have attracted the attention of agriculturists. The keys to the tribes and genera should enable the user to identify the genera of all our grasses, and the text under each genus should enable him to determine the species of our economic grasses. Under each genus are given the type[1] and the synonyms based upon American species, or the names that have been used in an American publication.

The following generic names, of which the types have not been found, are based on American material but are unidentifiable from the descriptions:

Anthipsimus Raf., Journ. de Phys. **89**: 105, 1819.[2] Based on *A. gonopodus* Raf., "Dry hills of the Ohio."

Dactylogramma Link, Hort. Berol. **2**: 248. 1833. Based on *D. cinnoides* Link, described from garden specimens grown from seed from western North America.

Flexularia Raf., Journ. de Phys. **89**: 105. 1819. Based on *F. compressa* Raf., "Kentucky and Ohio."

The tribes have been arranged in a new sequence based on the complexity of the flower structure, the most primitive being placed first and the most highly developed last. It is impossible to arrange them in a lineal sequence and at the same time represent their relationships, as the phylogenetic development has not been along a single line. The present arrangement is the closest approximation to natural relationships that can be shown in sequence. The highest development in any given tribe may be far more complex than the most primitive example of the tribe placed above it, but the relative development of each tribe is believed to be fairly represented by its position in the sequence. The bamboos are placed lowest, as certain genera, such as Arundinaria, show the least differentiation in the floral structure. The Andropogoneae and Tripsaceae are highly specialized, as is shown by the great diversity and complexity of the floral structures. The tribe Oryzeae of most authors includes two groups of diverse genera, each worthy of tribal rank. The allies of rice (Oryza) are here retained in the tribe Oryzeae, while the allies of Indian rice (Zizania) have been segregated as the tribe Zizanieae. Several genera referred to Oryzeae in current works on the classification of the grasses but not represented in the United States are evidently not closely allied to either tribe. Their disposition is deferred, pending further study.

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[1] The type species of a genus is the species or one of the species the author had chiefly in mind when describing the genus. Most authors of to-day designate the type species, but earlier authors usually did not. To make the application of generic names more certain, old genera are now put on a type basis; that is, one of the original species is chosen as the type. If, then, a genus as originally established included species belonging in two or more genera the name of the genus goes with the type species and the species related to it. It will be seen that the type species of a genus as here given often bears a different generic name. (See Miegia, based on *Arundinaria macrosperma*, p. 22, and Panicularia, based on *Poa aquatica*, p. 34.) This means that the genus was based on a species previously described under a different genus. In this work the type species is given for all generic names, whether valid or synonyms. The reasons for selecting a certain species as the type are given in each case. Among several species, the one most familiar to the author of the genus may be selected as the type. Species described by Linnæus in his flora of Sweden (Flora Suecica) and in his flora of Lapland (Flora Lapponica) were familiar to him and are often the types of his genera. (For a further discussion of types, see Hitchcock, Generic Types with Special Reference to the Grasses of the United States, Amer. Journ. Bot. **5**: 248–253, May, 1918; and Report of the Committee on Generic Types of the Botanical Society of America, Science, n. ser. **49**: 333–336, Apr. 4, 1919.)

[2] The form for literature citations throughout this bulletin is in the main that used in publications of the United States National Herbarium.

The tribe Nazieae (Zoysieae) also is composed of diverse genera. Hilaria and Aegopogon should be segregated from Nazia, Anthephora, and their allies. They are more closely related to certain of the Chlorideae, such as Bouteloua and Cathestecum. For the present they are appended to the Nazieae, as their final disposition must await a careful comparison with several genera outside our geographical limits.

One species of each genus is illustrated. A few of the larger genera are represented by more than one illustration, especially if the habit of the species shows considerable diversity. The chief figure of each illustration shows the habit of the plant, and the accessory figures show the structure of the spikelets and florets. The habit drawings are usually half natural size; the details of the spikelet are enlarged from 2 to 20 times. The parts of the spikelet shown are selected to indicate generic differences and are not uniformly of comparable parts, though there is always a figure of a spikelet and generally of a floret. The habit drawings are by Mary Wright Gill, and the details of the spikelet are by Agnes Chase.

There are in the United States about 1,500 species of grasses. Of these about 60 are cultivated. Approximately 140 native species are important forage grasses and are constituents of our stock ranges or of wild prairie hay. Many others are occasionally eaten by stock but are not sufficiently abundant to be included among our economic grasses. About 60 species are weeds introduced from foreign countries, chiefly from Europe.

In this bulletin the word grass is used in its botanical sense, that is, as applying only to plants of the natural family Poaceae (or Gramineae). Many plants other than grasses are used for forage, among such the clovers, alfalfa, vetches, peas, beans, and other leguminous species being the most important. Sedges and rushes resemble grasses but belong to distinct plant families. The rushes (Juncaceae) are distinguished by having small green flowers with a 6-parted perianth. The sedges (Cyperaceae) are distinguished from grasses by having 3-ranked leaves. The stems are often 3-sided. The leaves of grasses are 2-ranked and the stems are never 3-sided. The flowers of sedges are small and greenish, like those of grasses, but there is no bract (palea) between the flower and the rachilla. Sedges and rushes usually inhabit wet places or marshes, though some of them (such as the nut-grass, *Cyperus rotundus*) are weeds in cultivated soil. They are usually of little importance as forage plants. The sedges and rushes are not included in this bulletin.

The cultivated grasses may be classified according to their use as grains, forage grasses, sugar-producing grasses, textile grasses, soil binders, lawn grasses, and ornamental grasses.

Grains are those grasses whose fruit or grain is used for food or for stock feed. The common grains are wheat, corn, oats, rye, barley, rice, sorghum, and millet.

The forage grasses are those used for meadows, pastures, soiling, and silage.

Meadow grasses are those cut for hay. The chief meadow grasses of the United States are (1) in the cool humid region, timothy, redtop, orchard grass, and meadow fescue; (2) in the warm humid region, Bermuda grass, Johnson grass, and (in Florida) Natal grass; (3) in the dry area east of the Great Plains, millet and sorghum (including its varieties, such as kafir and Sudan grass); (4) in the northern part of the Great Plains, brome-grass; (5) on the Pacific coast, wheat, oats, and barley for the production of grain hay.

Wild hay is chiefly from three sources: (1) Prairie hay from the region lying just east of the Great Plains, including various native species such as big bluestem (*Andropogon furcatus*), little bluestem (*A. scoparius*), Indian grass (*Sorghastrum nutans*), and switch-grass (*Panicum virgatum*); (2) fresh marsh hay from the region between the Dakotas and Michigan, including chiefly bluejoint (*Calamagrostis canadensis*), reed canary grass (*Phalaris arundinacea*), and slough-grass (*Beckmannia erucaeformis*); and (3) salt marsh hay used mostly for bedding and for packing, including usually salt-marsh grass (*Spartina patens*) and black-grass (a kind of rush, *Juncus gerardi*).

Pasture grasses are those that furnish forage to grazing animals. The two most important cultivated pasture grasses of the United States are bluegrass in the Northern States and Bermuda grass in the South. The meadow grasses are also used for pasture, and in the Gulf States carpet grass is of some importance.

The wild grasses used for grazing are commonly called range grasses. The most important are (1) on the Great Plains, buffalo grass, curly mesquite, and grama (*Bouteloua gracilis* and *B. hirsuta*); (2) in the Southwest, several species of grama (Bouteloua), Hilaria, and *Sporobolus airoides;* (3) in the mountain regions, pine-grass, blue bunch-grass, and mountain bunch-grass (in Oregon); Arizona fescue (in northern Arizona); and the wheat-grasses (in the Rocky Mountains).

Soiling grasses, those cut and fed green, include the common small grains, corn, and the sorghums, and (locally in the South) pearl millet and teosinte.

Any forage grass may be preserved in a silo, but corn is the one most commonly used for this purpose.

The most important lawn grasses are (1) in the North, bluegrass, Rhode Island bent, and creeping bent; (2) in the South, Bermuda grass, carpet grass, and St. Augustine grass.

The ornamental grasses include the reeds, such as pampas grass and eulalia; border grasses, such as fountain grass and blue fescue; and variegated grasses, such as ribbon grass.

Soil-binding grasses are species having vigorous rhizomes which hold sand or other loose soil and prevent erosion by water or wind. Banks are secured against water erosion by a covering of redtop or Bermuda grass. The most important sand binder in use in this country is beach-grass (*Ammophila arenaria*). This is planted upon sand dunes to prevent wind erosion.

The two sugar-producing grasses are sugar cane and the saccharine varieties of sorghum. No textile grasses are cultivated in the United States. The esparto grasses (*Spartina tenacissima* and *Lygeum spartum*) of Spain and Algeria furnish fiber for the manufacture of paper and cordage.

All these grasses are mentioned in the text under the proper genus. (See index.)

POACEAE, THE GRASS FAMILY.

Flowers perfect (rarely unisexual), small, with no distinct perianth, arranged in spikelets consisting of a shortened axis (*rachilla*) and 2 to many 2-ranked bracts, the lowest two being empty (the *glumes*, rarely one or both of these obsolete), the one or more succeeding ones (*lemmas*) bearing in their axils a single flower, and, between the flower and the rachilla, a second 2-nerved bract (the *palea*), the lemma, palea, and flower together constituting the floret; stamens 1 to 6, usually 3, with very delicate filaments and 2-celled anthers; pistil 1, with a 1-celled 1-ovuled ovary, 2 (rarely 1 or 3) styles, and usually plumose stigmas; fruit a caryopsis with starchy endosperm and a small embryo at the base on the side opposite the hilum.

Herbs, or rarely woody plants, with usually hollow stems (*culms*) closed at the nodes, and 2-ranked parallel-veined leaves, these consisting of 2 parts, the *sheath*, enveloping the culm, its margins overlapping or sometimes grown together, and the *blade*, usually flat; between the two on the inside, a membranaceous hyaline or hairy appendage (the *ligule*).

The spikelets are almost always aggregated in spikes or panicles at the ends of the main culms or branches. The perianth is usually represented by 2 (rarely 3) small hyaline scales (the *lodicules*) at the base of the flower inside the lemma and palea. The grain or caryopsis (the single seed and the adherent pericarp) may be free, as in wheat, or permanently inclosed in the lemma and palea, as in the oat. Rarely the seed is free from the pericarp, as in species of Sporobolus and Eleusine. The culms of bamboos are woody, as are also those of a few genera, such as Olyra and Lasiacis, belonging to other tribes. The culms are solid in our species of the tribes Tripsaceae and Andropogoneae. The margins of the sheaths are grown together in species of Bromus, Danthonia, Festuca, Melica, Panicularia, and other genera.

The parts of the spikelet may be modified in various ways. The first glume, and more rarely also the second, may be wanting. The lemmas may contain no flower, or even no palea, or may be reduced or rudimentary. Rarely, as in species of Agrostis and Andropogon, the palea is obsolete.

Most of the genera of grasses fall naturally into one of the two series or subfamilies. The remaining few are rather arbitrarily assigned to one or the other series. In the same manner, most of the genera may be assembled into distinct and well-marked tribes, but several are not closely allied to the other genera in the tribe to which they are assigned but are so placed for convenience in classification.

DESCRIPTIONS OF THE SUBFAMILIES AND KEYS TO THE TRIBES.

SUBFAMILY 1, POATAE.

Spikelets 1 to many flowered, the reduced florets, if any, above the perfect florets (except in Phalarideae; sterile lemmas below as well as above in Campulosus, Uniola, and Blepharidachne); articulation usually above the glumes; spikelets usually more or less laterally compressed.

Key to the tribes of Poatae.

Plants woody, the culms perennial; spikelets several-flowered. 1. **Bamboseae** (p. 22).

Plants herbaceous, the culms annual.

  Spikelets with 2 staminate, neuter, or rudimentary lemmas unlike and below the fertile lemma; no sterile or rudimentary florets above ---------------------------------- 8. **Phalarideae** (p. 199).

  Spikelets without sterile lemmas below the perfect floret (or these rarely present and like the fertile ones, a dissimilar pair below and a rudimentary floret above in Blepharidachne).

    Spikelets unisexual, articulate below the glumes, 1-flowered, terete or nearly so --------------------- 10. **Zizanieae** (p. 206).

    Spikelets perfect (rarely unisexual but then not as above), usually articulate above the glumes.

      Spikelets articulate below the glumes, 1-flowered, very flat, the lemma and palea about equal, both keeled; glumes small or wanting --------------------- 9. **Oryzeae** (p. 204).

Spikelets articulate above the glumes (rarely below, but the glumes, at least one, well developed).

Spikelets 1-flowered in groups (short spikes) of 2 to 5 (single in Osterdamia), the groups racemose along a main axis, falling entire; lemma and palea thinner than the glumes 6. **Nazieae** (p. 165).

Spikelets not as above.

Spikelets sessile on a usually continuous rachis (short-pedicellate in Leptochloa; the rachis disarticulating in Monerma, Pholiurus, Hordeum, Sitanion, and a few species of allied genera).

Spikelets on opposite sides of the rachis; spike terminal, single 3. **Hordeae** (p. 87).

Spikelets on one side of the rachis; spikes usually more than 1, digitate or racemose. 7. **Chlorideae** (p. 171).

Spikelets pedicellate in open or contracted, sometimes spikelike, panicles (sessile and distant in *Eragrostis sessilispica*).

Spikelets 1-flowered 5. **Agrostideae** (p. 121).

Spikelets 2 to many flowered.

Glumes as long as the lowest floret, usually as long as the spikelet; lemmas awned from the back (spikelets awnless in Koeleria and Sphenopholis). 4. **Aveneae** (p. 106).

Glumes shorter than the first floret (except in Dissanthelium with long rachilla joints); lemmas awnless or awned from the tip or from a bifid apex. 2. **Festuceae** (p. 24).

SUBFAMILY 2, PANICATAE.

Spikelets with one perfect terminal floret (disregarding those of the few monœcious genera and the staminate and neuter spikelets) and a sterile or staminate floret below, usually represented by a sterile lemma only, one glume sometimes (rarely both glumes) wanting; articulation below the spikelets, either in the pedicel, in the rachis, or at the base of a cluster of spikelets, the spikelets falling entire, singly, in groups, or together with joints of the rachis; spikelets, or at least the fruits, more or less dorsally compressed.

Key to the tribes of Panicatae.

Glumes membranaceous, the sterile lemma like the glumes in texture.

Fertile lemma and palea thinner than the glumes; sterile lemma awned from the notched summit 11. **Melinideae** (p. 212).

Fertile lemma and palea indurate or at least firmer than the glumes. 12. **Paniceae** (p. 213).

Glumes indurate; fertile lemma and palea hyaline or membranaceous, the sterile lemma (when present) like the fertile one in texture.

Spikelets unisexual, the pistillate below, the staminate above, on the same inflorescence or in separate inflorescences. 14. **Tripsaceae** (p. 280).

Spikelets in pairs, one sessile and perfect, the other pedicellate and usually staminate or neuter (the pedicellate one sometimes obsolete, rarely both pedicellate); lemmas hyaline.
13. **Andropogoneae** (p. 252).

DESCRIPTIONS OF THE TRIBES AND KEYS TO THE GENERA.

Tribe 1, Bamboseae.

The tribe which includes the bamboos is for the most part confined to the Tropics and Subtropics. One genus extends into the southern United States. The bamboos have woody jointed, usually hollow culms either erect or vinelike. Some of the larger kinds are as much as a foot in diameter and 100 feet in height. The common economic species of the Tropics, such as *Bambos vulgaris* Schrad. (*Bambos bambos* (L.) Wight), because of the large hollow culms with hard partitions at the nodes found in most large species, can be used for a great variety of purposes. Many kinds of bamboos are cultivated for ornament in the warmer parts of the United States, especially in Florida and California. *Arundinaria japonica* Sieb. and Zucc. with several-flowered spikelets, and a few species of Phyllostachys, are hardy as far north as Washington. They form dense masses of shoots, usually 8 to 20 feet high. Phyllostachys does not usually flower in this country, but the plants can be distinguished by the internodes which are flattened on one side. Bambusa is a modified spelling of the original Bambos.

Tribe 2, Festuceae.

Spikelets more than 1-flowered, usually several-flowered, in open, narrow, or sometimes spikelike panicles; lemmas awnless or awned from the tip, rarely from between the teeth of a bifid apex; rachilla usually disarticulating above the glumes and between the florets.

A large and important tribe, mainly inhabitants of the cooler regions. The lemma is divided into several awns in Pappophorum and its allies, is deeply 2-lobed in Triplasis and in a few species of Triodia, 3-lobed in Blepharidachne, several-toothed in Orcuttia, and slightly 2-toothed in Bromus and a few other genera, the awn, when single, arising from between the teeth. The paleas are persistent upon the continuous rachilla in most species of Eragrostis. Scleropogon, Monanthochloë, Distichlis, and a few species of Poa and Eragrostis are diœcious. Gynerium, Cortaderia, Arundo, and Phragmites are tall reeds. In Blepharidachne there is a pair of sterile florets at the base of the single fertile floret, and a rudiment above. In some species of Melica there is, above the fertile florets, a club-shaped rudiment consisting of one or more sterile lemmas. In Uniola there are one to four sterile lemmas below the fertile ones. In *Melica imperfecta* and *M. torreyana* there may be but one perfect floret.

Key to the genera of Festuceae.

1a. Plants diœcious, the sexes very dissimilar, the pistillate lemmas with 3 long twisted divergent awns, the staminate lemma awnless or mucronate .... 30. Scleropogon.

1b. Plants with perfect flowers, or, if diœcious, the sexes not dissimilar in appearance 2

2a. Lemmas divided at the summit into 5 to several awns or awnlike lobes 3

3a. Awnlike lobes 5; inflorescence a simple erect raceme .... 29. Orcuttia.

3b. Awns 9 or more 4

4a. Awns unmixed with awned teeth; all the florets falling attached, their awns forming a pappuslike crown, only the lowest floret fertile; panicles narrow .... 32. Pappophorum.

4b. Awns mixed with awned teeth; florets not falling attached, the rachilla disarticulating between them; panicles somewhat open .... 31. Cottea.

2b. Lemmas awnless, with a single awn, or, if 3, the lateral awns minute 5

5a. Tall stout reeds with large plumelike panicles; lemmas or rachilla with long silky hairs as long as the lemmas 6

6a. Lemmas hairy; rachilla naked .... 19. Arundo.

6b. Lemmas naked; rachilla hairy .... 20. Phragmites.

5b. Low or rather tall grasses, rarely over 5 feet tall 7

7a. Plants diœcious, perennial; lemmas glabrous; grasses of salt or alkaline soils 8

8a. Plants low and creeping; spikelets obscure, scarcely differentiated from the short crowded rigid leaves .... 16. Monanthochloë.

8b. Plants erect from creeping rhizomes; spikelets in a narrow simple exserted panicle .... 17. Distichlis.

7b. Plants not diœcious (except in a few species of Poa with villous lemmas and in an annual species of Eragrostis) 9

9a. Spikelets of two forms, sterile and fertile intermixed; panicle dense, somewhat one-sided 10

10a. Fertile spikelets 2 or 3 flowered; sterile spikelets with numerous rigid awn-tipped glumes; panicle dense and spikelike .... 22. Cynosurus.

10b. Fertile spikelets with 1 perfect floret, long-awned; sterile spikelets with many obtuse glumes; panicle branchlets short, nodding. 23. Achyrodes.

9b. Spikelets all alike in the same inflorescence 11

11a. Lemmas 3-nerved, the nerves prominent, often hairy 12

12a. Inflorescence a few-flowered head or capitate panicle overtopped by the leaves or partly concealed in them; lemmas toothed or cleft; low plants of the arid regions 13

13a. Inflorescence hidden among the sharp-pointed leaves, not woolly; plants annual (Chlorideae) .... 97. Munroa.

13b. Inflorescence a capitate woolly panicle, not concealed; plants perennial 14

Key to the genera of Festuceae—Continued.

14a. Lemmas cleft either side of the midnerve to near the base, the lower two sterile, the third floret fertile, the fourth reduced to a 3-awned rudiment_ 28. BLEPHARIDACHNE.
14b. Lemma 2-lobed but not deeply cleft, all fertile but the uppermost ---------------------------------- 26. TRIODIA.
12b. Inflorescence an exserted open or spikelike panicle----------- 15
15a. Lemmas pubescent on the nerves or callus (except in *Triodia albescens*), the midnerve usually exserted as an awn or mucro -- 16
16a. Nerves glabrous; callus densely hairy; lemmas firm; panicle large, diffuse---------------------- 15. REDFIELDIA.
16b. Nerves hairy at least below, the lateral ones often conspicuously so---------------------------------- 17
17a. Palea long-ciliate on the upper half------ 27. TRIPLASIS.
17b. Palea sometimes villous but not long-ciliate on the upper half; perennials------------------ 26. TRIODIA.
15b. Lemmas not pubescent on the nerves nor callus (the internerves sometimes pubescent), awnless------------------ 18
18a. Glumes longer than the lemmas; lateral nerves of lemma marginal, the internerves pubescent--- 14. DISSANTHELIUM.
18b. Glumes shorter than the lemmas; lateral nerves not marginal, the internerves glabrous----------------- 19
19a. Lemmas chartaceous; grain large and beaked, at maturity forcing the lemma and palea open_ 13. DIARINA.
19b. Lemmas membranaceous; if firm, the grain neither large nor beaked--------------------------------- 20
20a. Spikelets subterete; palea longer than the lemma, bowed out below------------ 12. MOLINIA.
20b. Spikelets compressed; palea not longer than the lemma, not bowed out below----------------- 21
21a. Lemmas truncate; spikelets 2-flowered. 11. CATABROSA.
21b. Lemmas acute or acuminate; spikelets 3 to many flowered; rachilla continuous, the paleas usually persistent after the fall of the lemmas----------- 10. ERAGROSTIS.
11b. Lemmas 5 to many nerved, the nerves sometimes obscure---------- 22
22a. Spikelets with 1 to 4 empty lemmas below the fertile florets; nerves obscure; lemmas firm----------------------------- 18. UNIOLA.
22b. Spikelets with no empty lemmas below the fertile florets; nerves usually prominent; lemmas membranaceous (firm in a few species of Bromus and Festuca)---------------------------- 23
23a. Lemmas flabellate; glumes wanting; inflorescence dense, cylindric; low annual------------------------ 25. ANTHOCHLOA.
23b. Lemmas not flabellate; glumes present; inflorescence not cylindric -- 24
24a. Palea winged on the lower half of the keels; spikelets linear, in a loose raceme---------------- 5. PLEUROPOGON.
24b. Palea not winged on the lower half of the keels; inflorescence mostly paniculate------------------------ 25
25a. Lemmas as broad as long, the margins outspread; florets closely imbricate, horizontally spreading_ 9. BRIZA.
25b. Lemmas longer than broad, the margins clasping the palea; florets not horizontally spreading------ 26

Key to the genera of Festuceae—Continued.

26a. Callus of florets bearded; lemmas erose at the summit ------ 7. FLUMINEA.

26b. Callus not bearded (lemmas cobwebby at base in Poa); lemmas not erose (slightly in Puccinellia) ------ 27

27a. Lemmas keeled on the back (somewhat rounded in *Poa scabrella* and its allies) ------ 28

28a. Spikelets strongly compressed, crowded in one-sided clusters at the ends of the stiff, naked panicle branches ------ 21. DACTYLIS.

28b. Spikelets not strongly compressed, not crowded in one-sided clusters ------ 29

29a. Lemmas awned from a minutely bifid apex (awnless or nearly so in *Bromus unioloides* and *B. brizaeformis*); spikelets large ------ 2. BROMUS.

29b. Lemmas awnless; spikelets small ------ 8. POA.

27b. Lemmas rounded on the back (slightly keeled toward the summit in Festuca and Bromus) ------ 30

30a. Glumes papery; lemmas firm, strongly nerved, scarious-margined; upper florets sterile, often reduced to a club-shaped rudiment infolded by the broad upper lemmas; spikelets tawny or purplish, usually not green ------ 24. MELICA.

30b. Glumes not papery; upper florets not unlike the others ------ 31

31a. Nerves of the lemma parallel, not converging at the summit or but slightly so; lemmas awnless mostly obtuse ------ 32

32a. Nerves prominent; plants usually rather tall, growing in woods or fresh-water marshes ------ 4. PANICULARIA.

32b. Nerves faint; plants low, growing in saline soil. 6. PUCCINELLIA.

31b. Nerves of the lemma converging at the summit; lemmas awned or pointed (upper florets only minutely awn-tipped in *Bromus brizaeformis*) ------ 33

33a. Lemmas entire, awned from the tip or pointed (minutely toothed in *Festuca elmeri* and *F. gigantea*) ------ 3. FESTUCA.

33b. Lemmas awned or awn-tipped from a minutely bifid apex ------ 2. BROMUS.

TRIBE 3, HORDEAE.

Spikelets 1 to several flowered, sessile on opposite sides of a jointed or continuous axis forming symmetrical (not one-sided) spikes.

This small but important tribe, found in the temperate regions of both hemispheres, includes our most important cereals, wheat, barley, and rye. The rachis is flattened or concave next to the spikelets, or in some genera is thickened and hollowed out, the spikelets being more or less inclosed in the hollows. In Triticum and its allies there is one spikelet at each node of the rachis; in Hordeum and its allies there are two or three at each node. In Lolium and its allies the spikelets are placed edgewise to the rachis, and the first or inner glume is suppressed except in the terminal spikelet. The rachilla of the spikelet disarticulates at maturity in several genera. In some species of Elymus and especially in Sitanion the glumes are very slender, extending into long awns, in the latter genus sometimes divided into several slender bristles. In this tribe the blades of the leaves bear on each side at the base a small appendage or auricle.

Key to the genera of Hordeae.

1a. Spikelets solitary at each node of the rachis (rarely 2 in species of Agropyron, but never throughout) 2

2a. Spikelets 1-flowered, sunken in hollows in the rachis; spikes slender, cylindric; low annuals 3

3a. Lemmas awned; florets lateral to the rachis 36. SCRIBNERIA.

3b. Lemmas awnless; florets dorsiventral to the rachis 4

4a. First glume wanting 42. LEPTURUS.

4b. First glume present, the pair standing in front of the spikelet 43. PHOLIURUS.

2b. Spikelets 2 to several flowered, not sunken in the rachis 5

5a. Spikelets placed edgewise to the rachis; first glume wanting except in the terminal spikelet 41. LOLIUM.

5b. Spikelets placed flatwise to the rachis 6

6a. Plants perennial 33. AGROPYRON.

6b. Plants annual 7

7a. Glumes ovate, 3-nerved 34. TRITICUM.

7b. Glumes subulate, 1-nerved 35. SECALE.

1b. Spikelets more than 1 at each node of the rachis 8

8a. Spikelets 3 at each node of the rachis, 1-flowered, the lateral pair pediceled, usually reduced to awns 40. HORDEUM.

8b. Spikelets 2 at each node of the rachis, alike, 2 to 6 flowered 9

9a. Glumes wanting or reduced to 2 short bristles; spikelets horizontally spreading at maturity; spikes very loose 39. HYSTRIX.

9b. Glumes usually equaling the florets; spikelets appressed or ascending 10

10a. Rachis continuous (rarely tardily disarticulating); glumes broad or narrow, entire 37. ELYMUS.

10b. Rachis disarticulating at maturity; glumes subulate, extending into long awns, these and the awns of the lemmas making the spike very bristly 38. SITANION.

TRIBE 4, AVENEAE.

Spikelets 2 to several flowered in open or contracted panicles, or rarely in racemes (solitary in *Danthonia unispicata*); glumes usually as long as or longer than the first lemma, commonly longer than all the florets; lemmas usually awned from the back or from between the teeth of a bifid apex, the awn bent, often twisted, the callus and rachilla joints usually villous.

A rather small tribe widely distributed in both warm and cool regions. In our genera the rachilla is prolonged beyond the upper floret as a slender stipe (except in Aspris). The lemma is awnless or nearly so in Sphenopholis and in our species of Koeleria. These genera are placed in this tribe because they appear to be closely allied to Trisetum with which they agree in having oblanceolate glumes about as long as the first floret.

Key to the genera of Aveneae.

1a. Spikelets awnless or the upper lemma mucronate (rarely short-awned in Sphenopholis) ------ 2
2a. Articulation below the glumes; glumes distinctly different in shape, the second widened above ------ 46. Sphenopholis.
2b. Articulation above the glumes; glumes similar in shape. 44. Koeleria.
1b. Spikelets awned (awnless in *Trisetum wolfii*) ------ 3
3a. Florets 2, one perfect, the other staminate ------ 4
4a. Lower floret staminate, the awn twisted, geniculate, exserted ------ 48. Arrhenatherum.
4b. Lower floret perfect, awnless; awn of upper floret hooked. 51. Notholcus.
3b. Florets 2 or more, all alike except the reduced upper ones ------ 5
5a. Awn arising from between the teeth of a bifid apex, flattened, twisted; inflorescence a simple panicle or reduced to a raceme or even to a single spikelet ------ 52. Danthonia.
5b. Awn dorsal, not flattened; lemma often bifid at apex ------ 6
6a. Spikelets large, the glumes over 1 cm. long ------ 47. Avena.
6b. Spikelets less than 1 cm. long ------ 7
7a. Lemmas keeled, bidentate; awn arising from above the middle ------ 45. Trisetum.
7b. Lemmas convex; awn from below the middle ------ 8
8a. Rachilla prolonged behind the upper floret; lemmas truncate and erose-dentate at summit ------ 49. Aira.
8b. Rachilla not prolonged; lemmas tapering into 2 slender teeth ------ 50. Aspris.

Tribe 5, Agrostideae.

Spikelets 1-flowered, usually perfect, arranged in open, contracted, or spikelike panicles, but not in true spikes nor in one-sided racemes.

A large and important tribe, inhabiting more especially the temperate and cool regions. The articulation of the rachilla is usually above the glumes, the mature floret falling from the persistent glumes, but in a few genera the articulation is below the glumes, the mature spikelet falling entire (Alopecurus, Cinna, Polypogon, Lycurus, and Limnodea). The palea is small or wanting in some species of Agrostis. In a few genera the rachilla is prolonged behind the palea as a minute bristle, or sometimes as a more pronounced villous stipe (Brachyelytrum, Limnodea, Cinna, three species of Agrostis, Gastridium, Calamagrostis, Ammophila, and Lagurus). In some genera the rachilla joint between the glumes and the lemma is slightly elongated, forming a hard stipe which remains attached to the mature fruit as a pointed callus. The callus is well marked in Stipa (especially in *S. spartea* and its allies) and in Aristida, the mature lemma being terete, indurate, and convolute, the palea wholly inclosed. In many genera the lemma is awned either from the tip or from the back, the awn being trifid in Aristida.

Key to the genera of Agrostideae.

1a. Glumes wanting; a low annual ---- 58. Coleanthus.
1b. Glumes present (the first obsolete in *Muhlenbergia schreberi* and sometimes in Brachyelytrum and Phippsia) ---- 2
2a. Rachilla articulate below the glumes, these falling with the spikelet ---- 3
3a. Spikelets in pairs in a spikelike panicle, one perfect, the other staminate or neuter, the pair falling together ---- 63. Lycurus.
3b. Spikelets all alike ---- 4
4a. Glumes long-awned ---- 62. Polypogon.
4b. Glumes awnless ---- 5
5a. Rachilla not prolonged behind the palea; panicle dense and spikelike; glumes united toward the base, ciliate on the keel ---- 61. Alopecurus.
5b. Rachilla prolonged behind the palea; panicle narrow or open, not dense; glumes not united, not ciliate on the keel ---- 6
6a. Panicle narrow; lemma with a slender bent twisted awn from the bifid apex ---- 60. Limnodea.
6b. Panicle open and drooping; lemma with a minute straight awn just below the entire apex ---- 59. Cinna.
2b. Rachilla articulate above the glumes ---- 7
7a. Fruit dorsally compressed, indurate, smooth and shining, awnless ---- 74. Milium.
7b. Fruit laterally compressed or terete, awned or awnless ---- 8
8a. Fruit indurate, terete, awned, the nerves obscure; callus well developed, oblique, bearded ---- 9
9a. Awn trifid, the lateral divisions sometimes short, rarely obsolete (when obsolete no line of demarcation between awn and lemma as in the next) ---- 77. Aristida.
9b. Awn simple, a line of demarcation between the awn and the lemma ---- 10
10a. Awn persistent, twisted and bent, several to many times longer than the slender fruit; callus sharp-pointed ---- 76. Stipa.
10b. Awn deciduous, not twisted, sometimes bent, rarely more than 3 or 4 times as long as the plump fruit; callus short, usually obtuse ---- 75. Oryzopsis.
8b. Fruit thin or firm, but scarcely indurate, if firm, the nerves prominent or evident; callus not well developed ---- 11
11a. Glumes longer than the lemma (lemma equaling the glumes in *Agrostis spica-venti, A. aequivalvis,* and *A. thurberiana*) ---- 12
12a. Panicle feathery, capitate, nearly as broad as long; spikelets woolly ---- 66. Lagurus.
12b. Panicle not feathery; spikelets not woolly ---- 13
13a. Glumes compressed-carinate, abruptly mucronate, stiffly ciliate on the keels; panicle dense, cylindric or ellipsoid ---- 64. Phleum.
13b. Glumes not compressed-carinate, not ciliate ---- 14

Key to the genera of Agrostideae—Continued.

14a. Glumes saccate at base; lemma long-awned; inflorescence contracted, shining ---------- 65. GASTRIDIUM.
14b. Glumes not saccate at base; lemma awned or awnless; panicles open or contracted ---------- 15
  15a. Florets bearing a tuft of hairs at the base from the short callus, the hairs at least half as long as the lemma; palea present ---------- 53. CALAMAGROSTIS.
  15b. Florets without hairs at the base or with short hairs rarely as much as half the length of the lemma (*Agrostis hallii*); palea usually small or wanting ---------- 56. AGROSTIS.
11b. Glumes not longer than the lemma, usually shorter (the awn tips longer in *Muhlenbergia racemosa*) ---------- 16
  16a. Lemma awned from the tip or mucronate, 3 to 5 nerved (lateral nerves obsolete in *Muhlenbergia repens*) ---------- 17
    17a. Rachilla prolonged behind the palea; floret stipitate. 73. BRACHYELYTRUM.
    17b. Rachilla not prolonged; floret not stipitate ---------- 68. MUHLENBERGIA.
  16b. Lemma awnless or awned from the back ---------- 18
    18a. Florets bearing a tuft of hairs at the base from the short callus; lemma and palea chartaceous, awnless ---------- 19
      19a. Panicles spikelike; rachilla prolonged ---------- 54. AMMOPHILA.
      19b. Panicles open; rachilla not prolonged ---------- 55. CALAMOVILFA.
    18b. Florets without hairs at base ---------- 20
      20a. Nerves of lemma densely silky ---------- 70. BLEPHARONEURON.
      20b. Nerves of lemma not silky ---------- 21
        21a. Caryopsis at maturity falling from the lemma and palea; seed loose in the pericarp, this usually opening when ripe; lemma 1-nerved ---------- 22
          22a. Inflorescence capitate in the axils of broad bracts ---------- 71. CRYPSIS.
          22b. Inflorescence an open or contracted panicle. 69. SPOROBOLUS.
        21b. Caryopsis not falling from the lemma and palea, remaining permanently inclosed in them; seed adnate to the pericarp ---------- 23
          23a. Panicles few-flowered, slender, rather loose; glumes minute, unequal, the first often wanting; a low arctic alpine perennial ---------- 57. PHIPPSIA.
          23b. Panicle many-flowered, spikelike; glumes well developed, about equal ---------- 24
            24a. Panicle short, partly inclosed in the sheath; low annual ---------- 72. HELEOCHLOA.
            24b. Panicle elongate; perennial ---------- 67. EPICAMPES.

TRIBE 6, NAZIEAE.

Spikelets subsessile in short spikes of 2 to 5 (single in Osterdamia), each spike falling entire from the continuous axis, usually 1-flowered, all perfect, or perfect and staminate together in the same spike; glumes usually firmer than the lemma and palea, sometimes awned, the lemma awnless.

This small and unimportant tribe is known also as Zoysieae. In Osterdamia the spikelets are single and have only one glume, this coriaceous, much firmer than the lemma and palea, the palea sometimes obsolete.

Key to the genera of Nazieae.

1a. Spikelets single; first glume wanting ---------- 79. OSTERDAMIA.
1b. Spikelets in clusters of 2 to 5; first glume present ---------- 2
  2a. Spikelets bearing hooked spines on the second glume, the group forming a little bur ---------- 78. NAZIA.
  2b. Spikelets not bearing hooked spines, mostly cleft and awned ---------- 3
    3a. Groups of spikelets erect, the spike not one-sided ---------- 80. HILARIA.
    3b. Groups of spikelets nodding along one side of the delicate axis ---------- 81. AEGOPOGON.

TRIBE 7, CHLORIDEAE.

Spikelets 1 to several flowered, in 2 rows on one side of a continous rachis forming one-sided spikes or spikelike racemes, these solitary, digitate, or racemose along the main axis.

A large and rather important tribe, confined mostly to warm regions. The group is heterogeneous, the only common character of the genera (aside from the characters that place them in Poatae) being the arrangement of the spikelets in one-sided spikes. Chloris and the allied genera form a coherent group, in which the spikelet consists of one perfect floret and, above this, one or more modified or rudimentary florets. Leptochloa, Eleusine, and their allies, with several-flowered spikelets, are more nearly related to certain genera of Festuceae. The spike is reduced to two or three spikelets or even to one spikelet and is sometimes deciduous from the main axis in Cathestecum and in some species of Bouteloua. In Campulosus there are two sterile florets below the perfect one.

Key to the genera of Chlorideae.

1a. Plants monœcious or diœcious; a low stoloniferous perennial ---------- 98. BULBILIS.
1b. Plants with perfect flowers ---------- 2
  2a. Spikelets with more than one perfect floret ---------- 3
    3a. Inflorescence a few-flowered head or capitate panicle hidden among the sharp-pointed leaves; a low spreading annual ---------- 97. MUNROA.
    3b. Inflorescence exserted ---------- 4
      4a. Spikes solitary, the spikelets distant, appressed, several-flowered ---------- 83. TRIPOGON.
      4b. Spikes more than 1 ---------- 5
        5a. Spikes numerous, slender, racemose on an elongate axis ---------- 82. LEPTOCHLOA.
        5b. Spikes few, digitate or nearly so ---------- 6
          6a. Rachis of spike extending beyond the spikelets ---------- 85. DACTYLOCTENIUM.
          6b. Rachis not prolonged ---------- 84. ELEUSINE.
  2b. Spikelets with only 1 perfect floret, often with additional imperfect florets above ---------- 7

Key to the genera of Chlorideae—Continued.

7a. Spikelets without additional modified florets, the rachilla sometimes prolonged 8
8a. Rachilla articulate below the glumes, the spikelets falling entire 9
9a. Glumes unequal, narrow .... 90. SPARTINA.
9b. Glumes equal, broad and boat shaped .... 89. BECKMANNIA.
8b. Rachilla articulate above the glumes 10
10a. Spikes digitate; rachilla prolonged .... 86. CAPRIOLA.
10b. Spikes racemose along the main axis; rachilla not prolonged 11
11a. Spikes slender, divaricate, the main axis elongating and becoming loosely spiral in fruit .... 88. SCHEDONNARDUS.
11b. Spikes short and rather stout, appressed, the axis unchanged in fruit .... 87. WILLKOMMIA.
7b. Spikelets with 1 or more modified florets above the perfect one 12
12a. Spikelets with 2 sterile florets below the perfect one; second glume bearing a squarrose spine on the back; spike single, recurved .... 91. CAMPULOSUS.
12b. Spikelets with no sterile florets below the perfect one; second glume without a squarrose spine; spikes usually several 13
13a. Spikes digitate or nearly so 14
14a. Fertile lemma 1-awned or awnless .... 93. CHLORIS.
14b. Fertile lemma 3-awned .... 94. TRICHLORIS.
13b. Spikes racemose along the main axis 15
15a. Spikelets distant, appressed; spikes slender, elongate. 92. GYMNOPOGON.
15b. Spikelets contiguous or crowded, not appressed; spikes usually short and rather stout 16
16a. Spikelets 3 in each spike, the 2 lateral staminate or rudimentary; spikes falling entire .... 96. CATHESTECUM.
16b. Spikelets 2 to many (rarely 1) in each spike, all alike; spikes usually persistent, the florets falling. 95. BOUTELOUA.

TRIBE 8, PHALARIDEAE.

Spikelets with one perfect terminal floret and, below this, a pair of staminate or neuter florets.

A small tribe of about six genera, only three of which are found in the United States. In Phalaris the lateral florets are reduced to minute scalelike lemmas closely appressed to the edges of the fertile floret. In Torresia the lateral florets are staminate and as large as the fertile floret.

Key to the genera of Phalarideae.

1a. Lateral florets staminate; spikelets brown and shining .... 99. TORRESIA.
1b. Lateral florets neuter; spikelets green or yellowish 2
2a. Lateral florets reduced to small awnless scalelike lemmas; spikelets much compressed laterally .... 101. PHALARIS.
2b. Lateral florets consisting of awned hairy sterile lemmas exceeding the fertile floret; spikelet terete .... 100. ANTHOXANTHUM.

Tribe 9, Oryzeae.

Spikelets 1-flowered, perfect, strongly laterally compressed, paniculate; glumes reduced or wanting; palea apparently 1-nerved; stamens 6.

A small tribe whose affinities are not evident. It includes rice, the important food plant.

Key to the genera of Oryzeae.

Glumes minute; lemma often awned ---------- 102. Oryza.
Glumes wanting; lemma awnless ---------- 103. Homalocenchrus.

Tribe 10, Zizanieae.

Spikelets unisexual, the pistillate terete or nearly so; glumes shorter than the lemma, usually one or both obsolete, the pedicel disarticulating below the spikelet.

A small tribe of uncertain affinities; the species aquatic or subaquatic, of no economic importance except the Indian rice (Zizania).

Key to the genera of Zizanieae.

1a. Culms slender; plants low; staminate and pistillate spikelets borne in separate inflorescences ---------- 2
  2a. Inflorescence a few-flowered spike; plants not stoloniferous. 107. Hydrochloa.
  2b. Inflorescence a panicle; plants stoloniferous ---------- 106. Luziola.
1b. Culms robust; plants tall; staminate and pistillate spikelets borne in the same panicle ---------- 3
  3a. Plants annual; pistillate spikelets on the ascending upper branches, the staminate on the spreading lower branches of the panicle ---------- 105. Zizania.
  3b. Plants perennial; pistillate spikelets at the ends, the staminate below on the same branches of the panicle ---------- 104. Zizaniopsis.

Tribe 11, Melinideae.

Spikelets disarticulating below the glumes, these very unequal, the first minute, the second and the sterile lemma equal, membranaceous, strongly nerved, the latter bearing a slender awn from the notched summit; fertile lemma and palea thinner in texture, awnless.

A tribe of about a dozen genera, none of which is represented in the United States. The only economic species is *Melinis minutiflora* (see p. 212).

Tribe 12, Paniceae.

Spikelets with one perfect terminal floret and below this a sterile floret and two glumes; fertile lemma and palea indurate or at least firmer than the glumes and sterile lemma; articulation below the spikelet.

A large tribe, confined mostly to warm regions, and containing few economic species. The first glume is wanting in some genera, such as Paspalum, and rarely the second glume also (Reimarochloa).

The spikelets are usually awnless, but the glumes and sterile lemma are awned in Echinochloa and Oplismenus, and the second glume and sterile lemma in Tricholaena. In Eriochloa and in some species of Brachiaria the fertile lemma is awn-tipped. In Chaetochloa there are, beneath the spikelet, one or more bristles, these representing sterile branchlets. In Pennisetum similar bristles form an involucral cluster, falling with the spikelet. In Cenchrus the bristles are united, forming a bur. The spikelets are of two kinds in Amphicarpon, aerial and subterranean. The culms are woody and perennial in Lasiacis and Olyra.

Key to the genera of Paniceae.

1a. Spikelets of two kinds 2
2a. Spikelets all perfect, but those of the aerial panicle not perfecting grains; the fruitful spikelets borne on subterranean branches 127. Amphicarpon.
2b. Spikelets unisexual, the pistillate above, the staminate below on the branches of the same panicle; blades broad, elliptic. Olyra. (See p. 252.)
1b. Spikelets all of one kind 3
3a. Spikelets sunken in the cavities of the flattened corky rachis. 112. Stenotaphrum.
3b. Spikelets not sunken in the rachis 4
4a. Spikelets subtended or surrounded by 1 to many distinct or more or less connate bristles, forming an involucre 5
5a. Bristles persistent, the spikelets deciduous 124. Chaetochloa.
5b. Bristles falling with the spikelets at maturity 6
6a. Bristles not united at base, slender, often plumose. 125. Pennisetum.
6b. Bristles united into a burlike involucre, the bristles retrorsely barbed 126. Cenchrus.
4b. Spikelets not subtended by bristles 7
7a. Glumes or sterile lemma awned (awn short and concealed in the silky hairs of the spikelet in Tricholaena, awn reduced to a point in *Echinochloa colonum*) 8
8a. Inflorescence paniculate; spikelets silky 123. Tricholaena.
8b. Inflorescence of unilateral simple or somewhat compound racemes along a common axis; spikelets smooth or hispid, not silky 9
9a. Blades lanceolate, broad and thin; glumes 2-lobed, awned from between the lobes. 121. Oplismenus.
9b. Blades long and narrow; glumes awned from the tip 122. Echinochloa.
7b. Glumes and sterile lemma awnless 10
10a. Fruit cartilaginous-indurate, flexible, usually dark colored, the lemma with more or less prominent white hyaline margins, these not inrolled 11
11a. Spikelets covered with long silky hairs, arranged in racemes, these panicled 109. Valota.
11b. Spikelets glabrous or variously pubescent but not long-silky 12

Key to the genera of Paniceae—Continued.

12a. Spikelets in slender racemes more or less digitate at the summit of the culms ... 110. Syntherisma.
12b. Spikelets in panicles ... 13
13a. Fruiting lemma boat shaped; panicles narrow. 108. Anthaenantia.
13b. Fruiting lemmas convex; panicles diffuse ... 111. Leptoloma.
10b. Fruit chartaceous-indurate, rigid ... 14
14a. Spikelets placed with the back of the fruit turned away from the rachis of the racemes, usually single (not in pairs) ... 15
15a. First glume and the rachilla joint forming a swollen ringlike callus below the spikelet ... 113. Eriochloa.
15b. First glume present or wanting, not forming a ringlike callus below the spikelet ... 16
16a. First glume present; racemes racemose along the main axis ... 114. Brachiaria.
16b. First glume wanting; racemes digitate or subdigitate. 115. Axonopus.
14b. Spikelets placed with the back of the fruit turned toward the rachis of the spikelike racemes, or pedicellate in panicles ... 17
17a. Fruit long-acuminate; both glumes wanting ... 116. Reimarochloa.
17b. Fruit not long-acuminate, at least one glume present ... 18
18a. First glume typically wanting; spikelets plano-convex, subsessile in spikelike racemes ... 117. Paspalum.
18b. First glume present; spikelets usually in panicles ... 19
19a. Second glume inflated-saccate, this and the sterile lemma much exceeding the stipitate fruit. 120. Sacciolepis.
19b. Second glume not inflated-saccate ... 20
20a. Culms woody and bamboolike; fruit with a tuft of down at the apex ... 119. Lasiacis.
20b. Culms herbaceous; no tuft of down at the apex of the fruit ... 118. Panicum.

Tribe 13, Andropogoneae.

Spikelets in pairs along a rachis, the usual arrangement being one of the pair sessile and fertile, the other pedicellate and staminate or neuter, or rarely wanting, only the pedicel present; fertile spikelet consisting of one perfect terminal floret and, below this, a staminate or neuter floret, the lemmas thin or hyaline, and two awnless glumes, one or usually both firm or indurate.

A large tribe, confined mostly to warm regions. The rachis is usually jointed, disarticulating at maturity, with the spikelets attached. In a few genera it is thickened. Sometimes the racemes are shortened to 1 or 2 joints and borne on branches, the whole forming a panicle (as in Holcus and Sorghastrum) instead of a series of racemes. In a few genera the spikelets of the pair are alike. In Trachypogon the fertile spikelet is pedicellate and the sterile one nearly sessile.

Key to the genera of Andropogoneae.

1a. Spikelets all perfect, surrounded by a copious tuft of soft hairs ------ 2
2a. Rachis continuous, the spikelets falling; spikelets of the pair unequally pedicellate ------ 3
3a. Racemes in a narrow spikelike panicle, spikelets awnless ------ 128. Imperata.
3b. Racemes in a broad fan-shaped panicle; spikelets awned. 129. Miscanthus.
2b. Rachis breaking up into joints at maturity with the spikelets attached; one spikelet sessile, the other pedicellate ------ 4
4a. Spikelets awnless ------ 130. Saccharum.
4b. Spikelets awned ------ 131. Erianthus.
1b. Spikelets unlike, the sessile perfect, the pedicellate sterile (sessile spikelet staminate, pedicellate spikelet perfect in Trachypogon) ------ 5
5a. Pedicel thickened, appressed to the thickened rachis joint (at least parallel to it) or adnate to it; spikelets awnless, appressed to the joint ------ 6
6a. Rachis joint and pedicel adnate, forming a short flat joint, this sunken in the open side of the globose first glume of the sessile spikelet; sterile spikelet conspicuous ------ 140. Rytilix.
6b. Rachis joint and pedicel distinct, the sessile spikelet appressed to them, its first glume lanceolate ------ 7
7a. Racemes subcylindric; rachis joints and pedicels glabrous, much thicker at the summit, the spikelets sunken in the hollow below; sterile spikelet rudimentary ------ 139. Manisuris.
7b. Racemes flat; rachis joints and pedicels woolly, not much thicker at the summit; sterile spikelet staminate or neuter ------ 138. Elyonurus.
5b. Pedicel not thickened (if slightly so the spikelets awned), neither appressed nor adnate to the rachis joint, this usually slender; spikelets usually awned ------ 8
8a. Fertile spikelet with a hairy-pointed callus, formed of the attached supporting rachis joint or pedicel; awns strong ------ 9
9a. Racemes reduced to a single joint, long-peduncled in a simple open panicle ------ 135. Rhaphis.
9b. Racemes of several to many joints, single ------ 10
10a. Primary spikelet subsessile, sterile, persistent on the continuous axis after the fall of the fertile pedicellate spikelet, the pedicel forming the callus. 137. Trachypogon.
10b. Primary spikelet sessile, fertile; pedicellate spikelet sterile; lower few to several pairs of spikelets all staminate or neuter ------ 136. Heteropogon.
8b. Fertile spikelet without a callus, the rachis disarticulating immediately below the spikelet; awns slender ------ 11
11a. Racemes of several to many joints, solitary, digitate, or aggregate ------ 132. Andropogon.
11b. Racemes reduced to one or few joints, these mostly peduncled in a subsimple or compound panicle ------ 12
12a. Pedicellate spikelets staminate ------ 133. Holcus.
12b. Pedicellate spikelets wanting, the pedicel only present ------ 134. Sorghastrum.

TRIBE 14, TRIPSACEAE.

Spikelets unisexual, the staminate in pairs, or sometimes in threes, 2-flowered, the pistillate usually single, 2-flowered, the lower floret sterile, imbedded in hollows of the thickened articulate axis and falling attached to the joints, or inclosed in a thickened involucre or sheath or, in Zea, crowded in rows on a thickened axis (cob); glumes membranaceous or thick and rigid, awnless; lemmas and palea hyaline, awnless. Plants monœcious.

This small tribe of seven genera is scarcely more than a subtribe of Andropogoneae. It is also known as Maydeae.

Key to the genera of Tripsaceae.

1a. Staminate and pistillate spikelets in separate inflorescences, the first in a terminal tassel, the second in the axils of the leaves........ 2
  2a. Pistillate spikes distinct, the spikelets embedded in the hardened rachis, this disarticulating at maturity............... 142. EUCHLAENA.
  2b. Pistillate spikes grown together forming an ear, the grains at maturity much exceeding the glumes........................ 143. ZEA.
1b. Staminate and pistillate spikelets in separate portions of the same spike, the pistillate below.. 3
  3a. Spikes short, the 1 or 2 flowered pistillate portion inclosed in a beadlike sheathing bract.................................. 144. COIX.
  3b. Spikes many-flowered, the pistillate portion breaking up into several 1-seeded joints; no beadlike sheathing bract... 141. TRIPSACUM.

DESCRIPTIONS OF THE GENERA.

1. BAMBOSEAE, THE BAMBOO TRIBE.

1. ARUNDINARIA Michx.

Spikelets few to many flowered, large, compressed, the rachilla disarticulating above the glumes and between the florets; glumes unequal, shorter than the lemmas, the first sometimes wanting; lemmas acute or acuminate or mucronate, faintly many-nerved; palea about as long as the lemma, prominently 2-keeled.

Shrubs or tall reeds, with woody perennial branching culms, flat blades with petioles articulate with the sheaths, and loose racemes or panicles. Species about 25, in the Tropics of both hemispheres; 2 species in the southeastern United States.

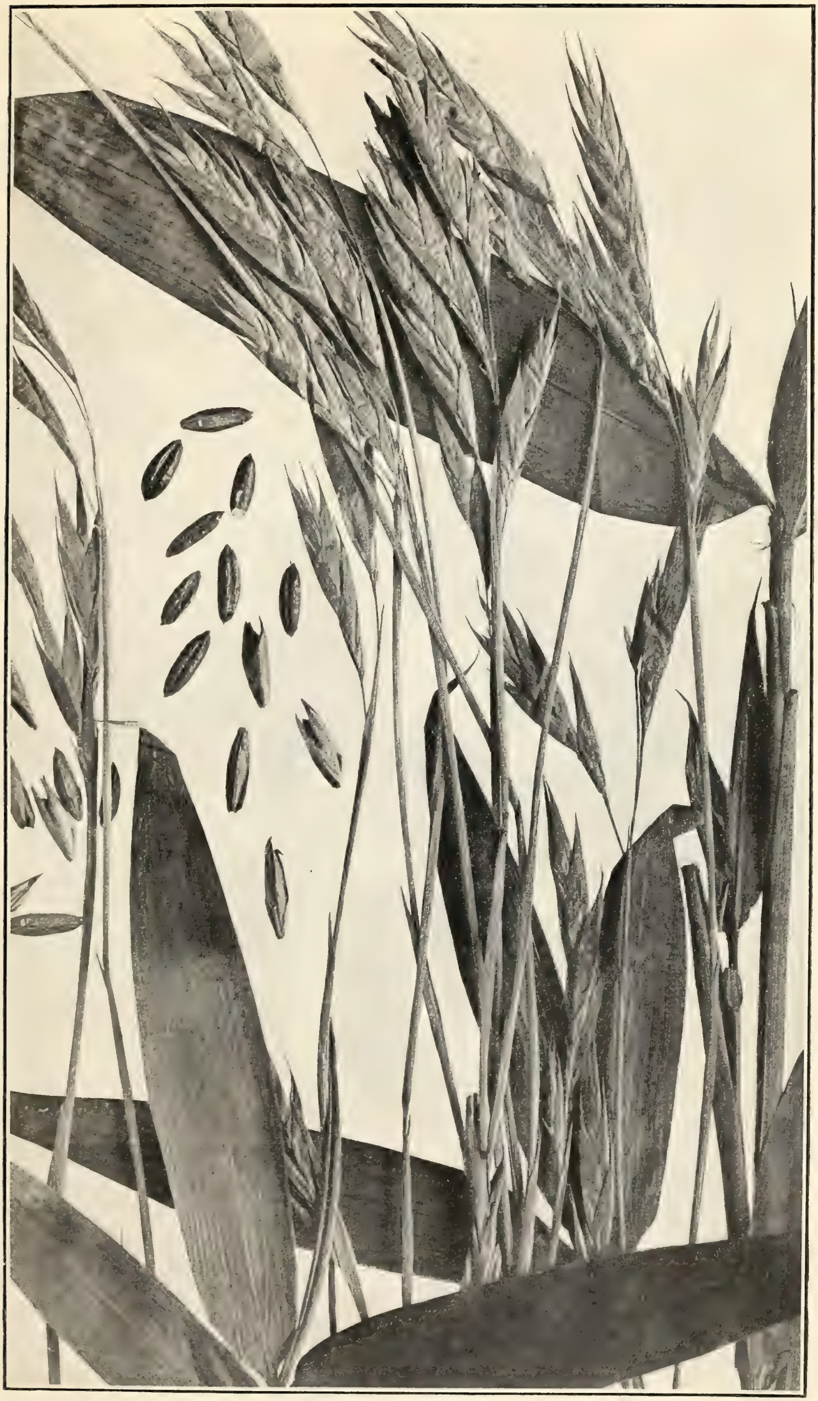
Type species: *Arundinaria macrosperma* Michx.

Arundinaria Michx., Fl. Bor. Amer. **1**: 73. 1803. One species described.

Miegia Pers., Syn. Pl. **1**: 101. 1805. A single species, based on *Arundinaria macrosperma* Michx., is included.

Macronax Raf., Med. Repos. ser. 2. **5**: 353. 1808. Based on "The Arundinaria of Michaux."

Our two species, *Arundinaria tecta* (Walt.) Muhl. (fig. 1) and *A. macrosperma* (Pl. I), are the only native representatives of the tropical tribe Bamboseae, or Bambuseae, the bamboos. Our species are known, respectively, as small and large cane. Both flower infre-



LARGE CANE (ARUNDINARIA MACROSPERMA). INFLORESCENCE, LEAVES, FLORETS, AND RIPE GRAINS.

MEADOW FESCUE (FESTUCA ELATIOR) IN FLOWER.

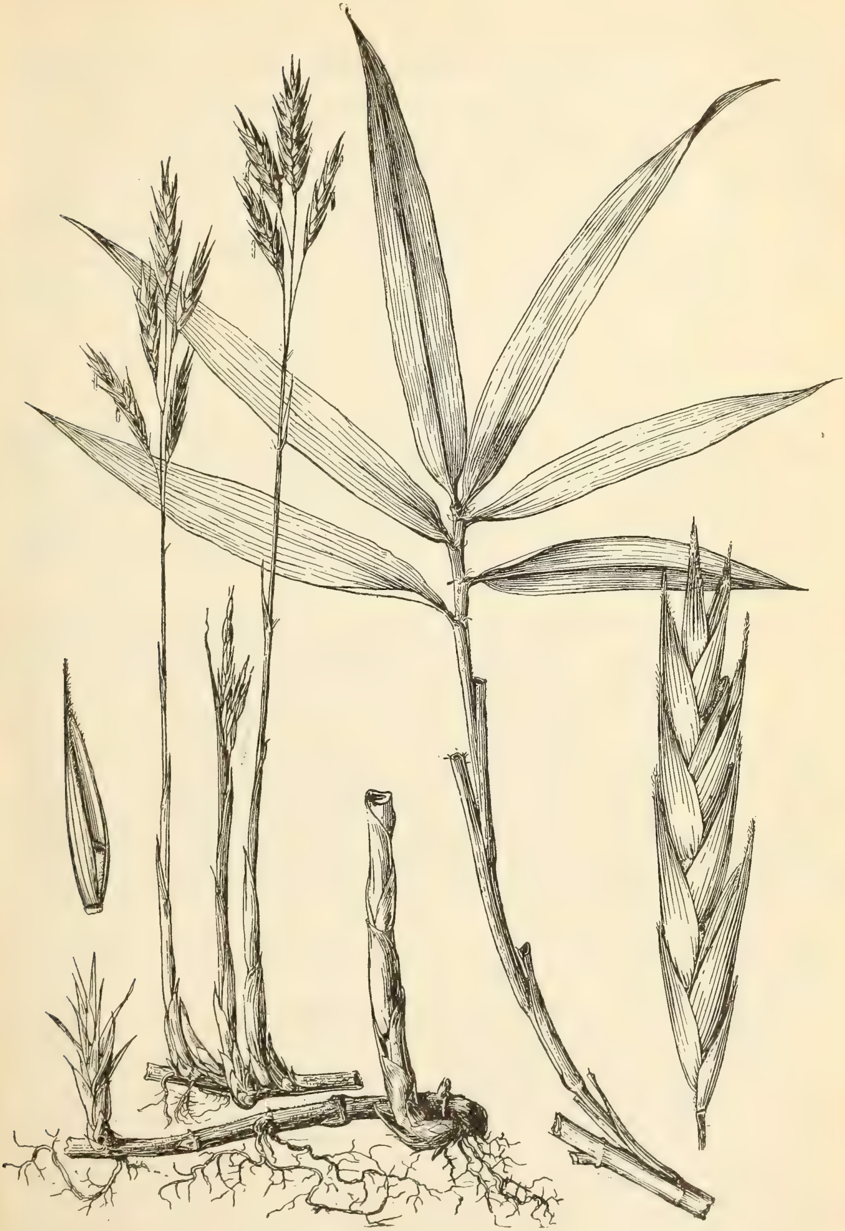


FIG. 1.—Small cane, *Arundinaria tecta*. Flowering shoot and leafy branch, × ½; spikelet and floret, × 2.

quently. The first is rarely over 6 feet tall, with drooping blades, the inflorescence on leafless or nearly leafless shoots from the base of the plant. This is found from Maryland southward. The other species grows to a height of as much as 25 or 30 feet and forms, in the alluvial river bottoms of the Southern States, dense thickets called canebrakes. The racemes are borne on leafy branches, the species flowering less frequently than the small cane.

Stock are fond of the young plants and of the leaves and seeds, and both species furnish much forage in localities where they are abundant. The young shoots are sometimes used as a potherb. The stems or culms of the large cane are used for fishing rods, pipestems, baskets, mats, light scaffolding, and for a variety of other purposes.

2. FESTUCEAE, THE FESCUE TRIBE.

2. BROMUS L., the brome-grasses.

Spikelets several to many flowered, the rachilla disarticulating above the glumes and between the florets; glumes unequal, acute, the first 1 to 3 nerved, the second usually 3 to 5 nerved; lemmas convex on the back or keeled, 5 to 9 nerved, 2-toothed at the apex, awnless or usually awned from between the teeth; palea usually shorter than the lemma.

Annual or perennial, low or rather tall grasses, with closed sheaths, flat blades, and open or contracted panicles of large spikelets. Species about 100, in temperate regions; about 43 species in the United States, of which 17 are introductions, mostly from Europe.

Type species: *Bromus secalinus* L.

Bromus L., Sp. Pl. 76, 1753; Gen. Pl., ed. 5, 33. 1754. Linnæus describes 11 species, all but the last 2 of which are still retained in the genus. The citation given after Bromus in the Genera Plantarum is "Mont. 32." This refers to figure 32 in the plate accompanying Monti's Catalogi Stirpium Agri Bononiensis Prodromus, published in 1719. This figure represents a spikelet of *Bromus secalinus*, or of a closely allied species. As *Bromus secalinus* is the first species described in the Species Plantarum and was described in the flora of Sweden, this species is chosen as the type.

Ceratochloa Beauv., Ess. Agrost. 75, pl. 15, f. 7. 1812. A single species included. *Festuca unioloides* Willd., which is the basis of *Bromus unioloides* (Willd.) H. B. K.

Zerna Panz., Denkschr. Baier. Akad. Wiss. Müench. **4**: 296. 1813. (Ideen Gatt. Gräser 46, pl. 11, f. 3.) Eleven species are included. *Bromus sterilis* L., the one figured, is taken as the type.

Serrafalcus Parl., Rar. Pl. Sic. **2**: 14. 1840. Six species are included. *Bromus racemosus* L., on which the first species is based, is taken as the type.

Forasaccus Bubani, Fl. Pyren. **4**: 380. 1901. Proposed for Bromus L., not Bromus of the ancients, which is said to be wild oats.

The section Ceratochloa has large compressed spikelets with compressed-keeled glumes and lemmas. One species, *Bromus unioloides* (Willd.) H. B. K., is cultivated as a forage grass under the name of rescue grass or Schrader's brome-grass. This is an annual or biennial grass 1 to 2 feet tall, with pubescent sheaths and narrow panicles of smooth spikelets as much as an inch long, the lemmas acuminate or awn-tipped. Rescue grass is a native of South America and is cultivated occasionally in our Southern States for winter forage. The other species of this section are natives of the western half of the United States. They are all perennials and have large awned spikelets. *Bromus carinatus* Hook. and Arn. and *B. marginatus* Nees are common on the Pacific coast. They have pubescent or scabrous spikelets, the first with an awn longer than the lemma, the second with an awn shorter than the lemma. *Bromus carinatus* often appears like an annual, flowering the first year.

The species of Bromus in which the spikelets are not compressed-keeled fall into two rather well-marked groups, perennials and annuals. The most important species of the first group is *Bromus inermis* Leyss., a European species known also as awnless brome-grass, Hungarian brome-grass, smooth brome-grass, and brome-grass. It is erect, 2 to 3 feet tall, with creeping rhizomes and narrow, many-flowered panicles with erect or ascending branches and smooth narrow spikelets about an inch long, the lemmas acute, awnless, or nearly so. Awnless brome-grass is cultivated for hay and pasture in the northern portion of the Great Plains from northern Kansas to Minnesota and Montana. It is more drought resistant than timothy and in the region mentioned can be grown farther west than that species, but does not thrive south of central Kansas. All the other perennial species are natives except *B. erectus*, occasionally introduced from Europe, and all have distinctly awned lemmas. *Bromus purgans* L. is a common woodland species in the Eastern States. This has an open drooping panicle with nearly terete spikelets, the lemmas pubescent over the back. The closely allied and equally common *B. ciliatus* L. (fig. 2) differs in having lemmas glabrous on the back and pubescent on the margins only. Several species are found in the Western States, *B. porteri* (Coult.) Nash, with close drooping panicle and softly pubescent spikelets, being common in the Rocky Mountains.

The group of annuals includes weedy species introduced mostly from Europe. The best known of these in the Eastern States is *Bromus secalinus* (fig. 3), chess or cheat, a weed of waste places and sometimes infesting grain fields. Formerly it was believed by the credulous that under certain conditions wheat changed into chess. Chess in a wheat field is due to chess seed in the soil or to chess seed in the wheat sown. Chess is a smooth grass 1 to 3 feet tall, with flat blades and open drooping panicles of smooth turgid spikelets, the lemmas broad and inrolled above, the awn about as long as the lemma. *Bromus commutatus* Schrad. differs in having pubescent sheaths.

On the Pacific coast the annual species of Bromus have become conspicuous. They thrive on all open ground at lower altitudes in

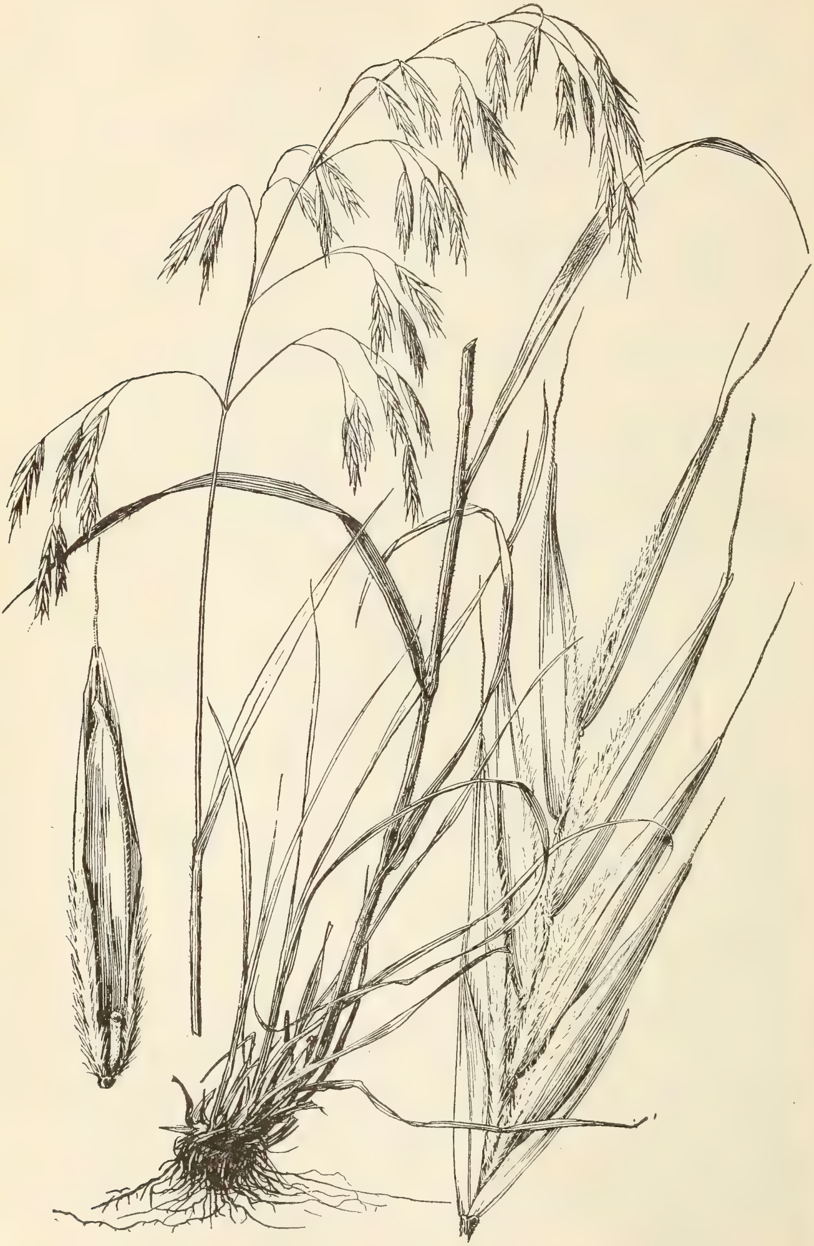


FIG. 2.—Wild brome-grass, *Bromus ciliatus*. Plant, × ½; spikelet and floret, × 5.

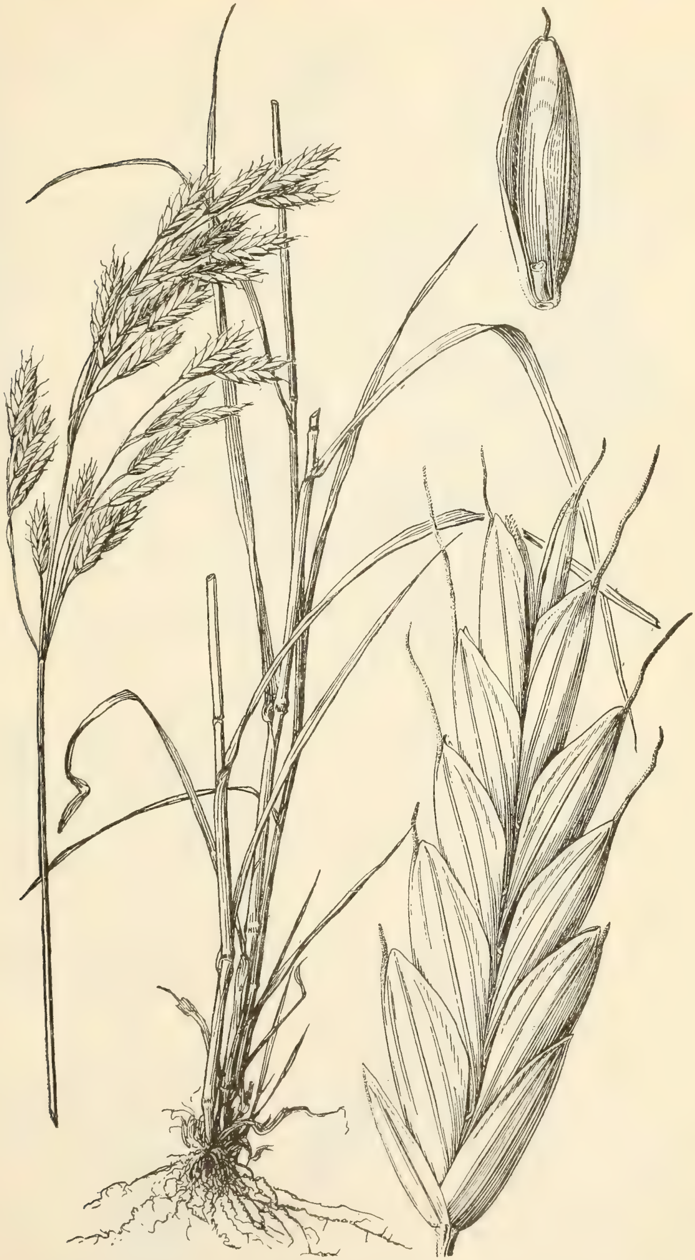


FIG. 3.—Chess (cheat), *Bromus secalinus*. Plant, × ½; spikelet and floret, × 5.

spring and early summer, and on the approach of the summer dry season they ripen their seed and turn brown. They often cover vast areas and have become a great pest. The commonest species are *B. rubens* L., with contracted panicles of narrow usually purplish spikelets; *B. hordeaceus* L., with compact panicles of short turgid usually pubescent spikelets like those of *B. secalinus; B. villosus* Forsk., with open rather few-flowered panicles and narrow spikelets with awns as much as 2 inches long; and *B. tectorum* L. (fig. 4), a rather small softly pubescent species, with drooping panicles of narrow spikelets. *Bromus trinii* Desv., found chiefly in the desert regions of California, introduced from Chile, is peculiar in having a bent awn twisted below. *Bromus arenarius* Labill., a recent introduction from Australia, is becoming common. This has an open panicle with capillary curved pedicels and short, pubescent spikelets.

The perennial species of Bromus are important forage grasses on the mountain ranges of the Western States. The annual species are good forage grasses when they are young, but they are rather evanescent. The fruits of *B. villosus* and *B. rubens* and their allies are injurious to stock, the sharp-pointed florets working their way into the eyes and nostrils. *Bromus secalinus* is grown for hay in Washington, in Oregon, and in Georgia.

For a revision of the species of Bromus found in the United States, see Shear, U. S. Dept. Agr., Div. Agrost. Bull. 23. 1900.

3. FESTUCA L., the fescue grasses.

Spikelets few to several flowered, the rachilla disarticulating above the glumes and between the florets; glumes narrow, acute, unequal, the first sometimes very small; lemmas rounded on the back, membranaceous or somewhat indurate, 5-nerved, the nerves often obscure, acute or rarely obtuse, awned from the tip or rarely from a minutely bifid apex.

Annual or perennial low or rather tall grasses of varied habit, the spikelets in narrow or open panicles. Species about 100, in the temperate and cool regions; about 40 species in the United States, 7 of which are introductions from Europe.

Type species: *Festuca ovina* L.

Festuca L., Sp. Pl. 73, 1753; Gen. Pl., ed. 5, 33. 1754. Linnæus describes 11 species. *Festuca ovina* is chosen as the type, as it is the first of the original species that is economic and is described in the flora of Sweden. Most of the original species are still retained in Festuca but *F. decumbens* is now placed in Sieglingia, *F. fluitans* in Panicularia, and *F. cristata* in Koeleria (*K. phleoides*).

Vulpia Gmel., Fl. Badens. 1: 8. 1805. One species, *V. myuros*, based on *Festuca myuros* L., is described, and two species of Festuca having a single stamen are mentioned in a note. *Festuca myuros* is taken as the type.

Schedonorus Beauv., Ess. Agrost. 99, pl. 19. f. 2. 1812. The first of the 25 species included and the one figured is "*Bromus elatior*" (L.) Koel., based on *Festuca elatior*. The figure shows a floret with a short awn below the minutely bidentate apex, as found in occasional specimens of *F. elatior*, which species is taken as the type.

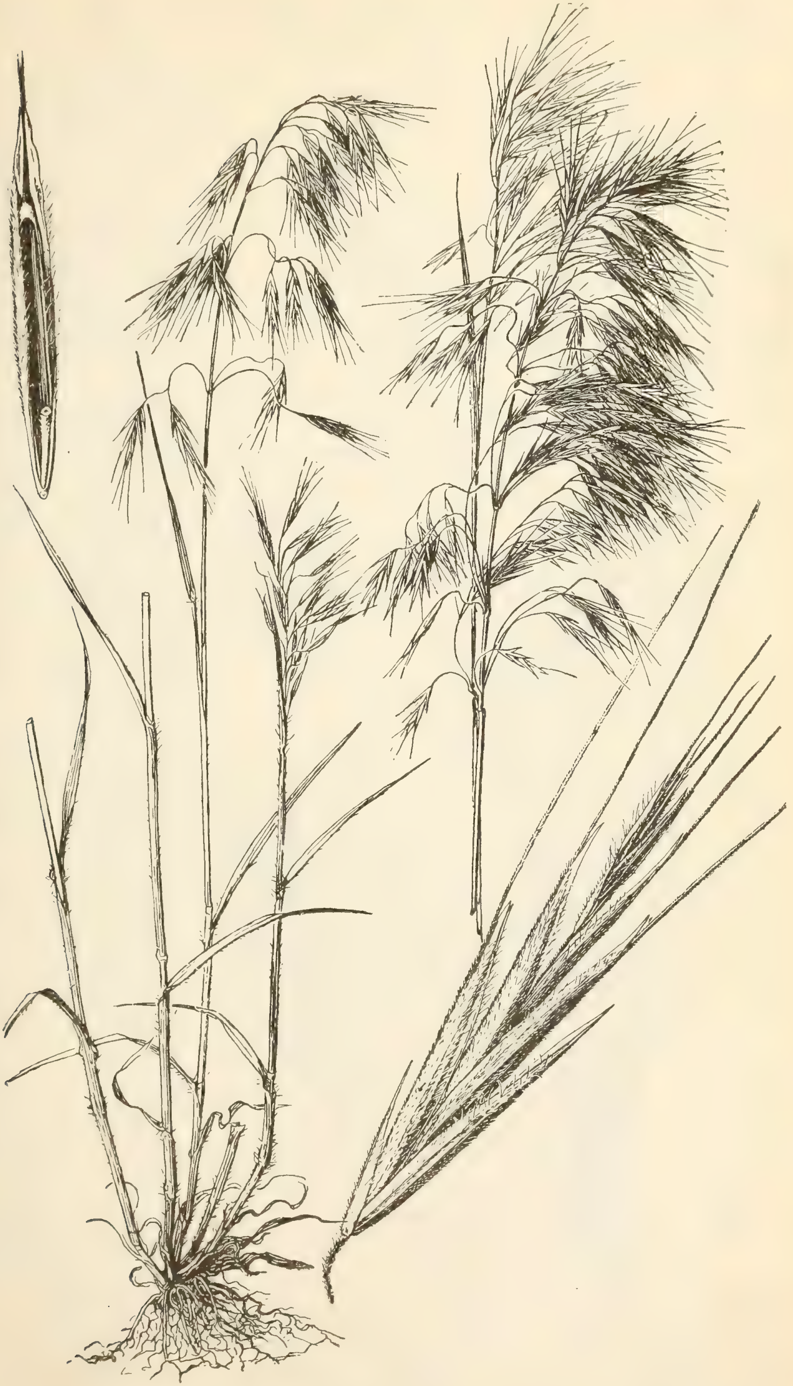


FIG. 4.—Downy brome-grass, *Bromus tectorum*. Plant, × ½; spikelet and floret, × 5.

Dasiola Raf., Neogenyt. 4. 1825. "Type Festuca monandra" Ell., renamed *D. elliottea* Raf. This is *F. sciurea* Nutt.

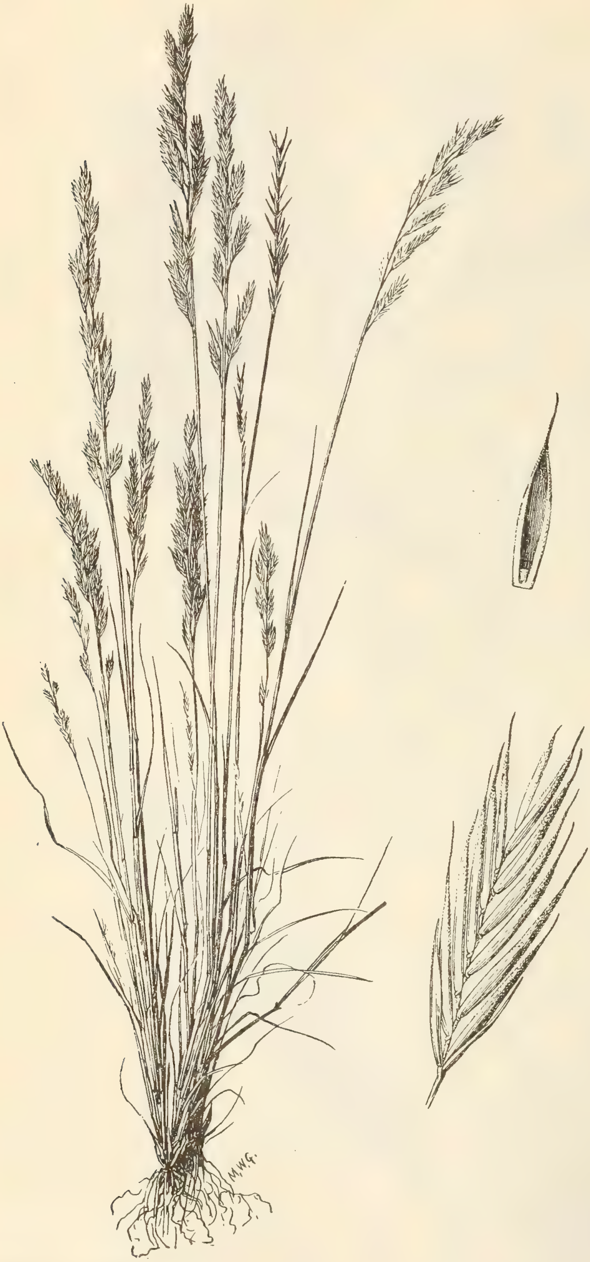


FIG. 5.—*Festuca octoflora.* Plant, × ½; spikelet and floret, × 5.

Chloamnia Raf., Neogenyt. 4. 1825. Two species are included, *Festuca tenella* and *F. bromoides.* The first, which is *F. octoflora* Walt., is taken as the type.

Hesperochloa (Piper) Rydb., Bull. Torrey Club **39:** 106. 1912. Based on Festuca subgenus Hesperochloa Piper, the type and only species of which is *F. confinis* Vasey.

Wasatchia Jones, Contr. West. Bot. **14:** 16. 1912. A single species is included, *W. kingii* (Watson) Jones, based on *Poa kingii* Watson, which is the same as *F. confinis* Vasey.

Gnomonia Lunell, Amer. Midl. Nat. **4:** 224. 1915. A new name proposed for Festuca L., not Dodonaeus, 1551.

The subgenus Vulpia, including annuals with mostly narrow panicles and flowers with but one stamen, is represented in the United States by 13 species, 2 of which, *Festuca myuros* L. and *F. bromoides* L., are introductions from Europe. *Festuca octoflora* Walt. (fig. 5), with spikelets usually more than 5-flowered and hard terete glabrous or scabrous lemmas with no scarious margin, is common throughout the United States. Several native species of this subgenus are found on the Pacific coast.

The subgenus Hesperochloa includes a single species *Festuca confinis* Vasey, a stout tufted perennial with creeping rhizomes, firm flat blades, and narrow panicles of awnless spikelets.

The remaining species, all perennials, are placed in the subgenus Eufestuca. Mountain bunch-grass (*F. viridula* Vasey) with narrow flat or loosely involute blades and awnless spikelets is common in the subalpine meadows of the northwestern mountains where it constitutes an important part of the forage. *Festuca subulata* Trin., a common woodland species of the Northwestern States, has flat thin blades and very open panicles of long-awned spikelets. Much resembling this is *F. subuliflora* Scribn., which is peculiar in having a stipelike elongation at the base of the florets. An allied Californian species, *F. elmeri* Scribn. and Merr., has spikelets like *F. subulata*, but the awn arises between the two minute teeth of the lemma. *Festuca obtusa* Spreng. is an eastern woodland species with very loose sparingly branched panicle and few awnless spikelets. The largest species of the genus in the United States is *F. californica* Vasey, found in dry woods of western California and Oregon. This grows in large tufts, with culms as much as 5 feet tall, hard flat or loosely involute blades, pilose on the collar, and large panicles.

The type species, *Festuca ovina*, is the representative of a large group of varieties or closely allied species in Europe. *Festuca ovina* itself is cultivated as a lawn or pasture grass under the name of sheep's fescue. It is a tufted grass 6 to 18 inches tall with firm, short, involute blades, crowded at the base of the slender culms, and narrow panicles of short-awned spikelets. This grass is used in mixtures for sterile or stony soil. Three allied European species are used in the same way but especially in mixtures for lawns. These are *F. duriuscula* L., hard fescue (a species rare in America), with blades about 1 mm. broad; *F. heterophylla* Lam., with flat stem blades; and *F. capillata* Lam., with very fine blades and awnless spikelets. Red fescue, *F. rubra* L. (fig. 6), differs in the loosely tufted culms with decumbent usually red bases. This is native in both Europe and America. Two species allied to *F. ovina* are native in the Western States and are both important range grasses. These are *F. idahoensis* Elmer (*F. ingrata* (Hack.) Rydb.), blue bunch-grass, with pale narrow stiff harshly scabrous blades 6 to 15 inches long, and awned spikelets, common from British Columbia to Colorado and California; and *F. arizonica* Vasey, Arizona fescue, with nearly awnless spikelets, found in northern Arizona and southern Utah.

The most important cultivated species of the genus is *Festuca elatior* L., meadow fescue (Pl. II; fig. 7). This is a smooth perennial, 1 to 4 feet high, with flat blades and a narrow but rather loose panicle 4 to 8 inches long, the awnless spikelets about half an inch long. Meadow fescue is cultivated for hay and pasture in the humid region, especially in Tennessee, Missouri, and eastern Kansas. There are two agricultural varieties of this species. The taller form with larger more open panicle is distinguished as tall fescue. The form more

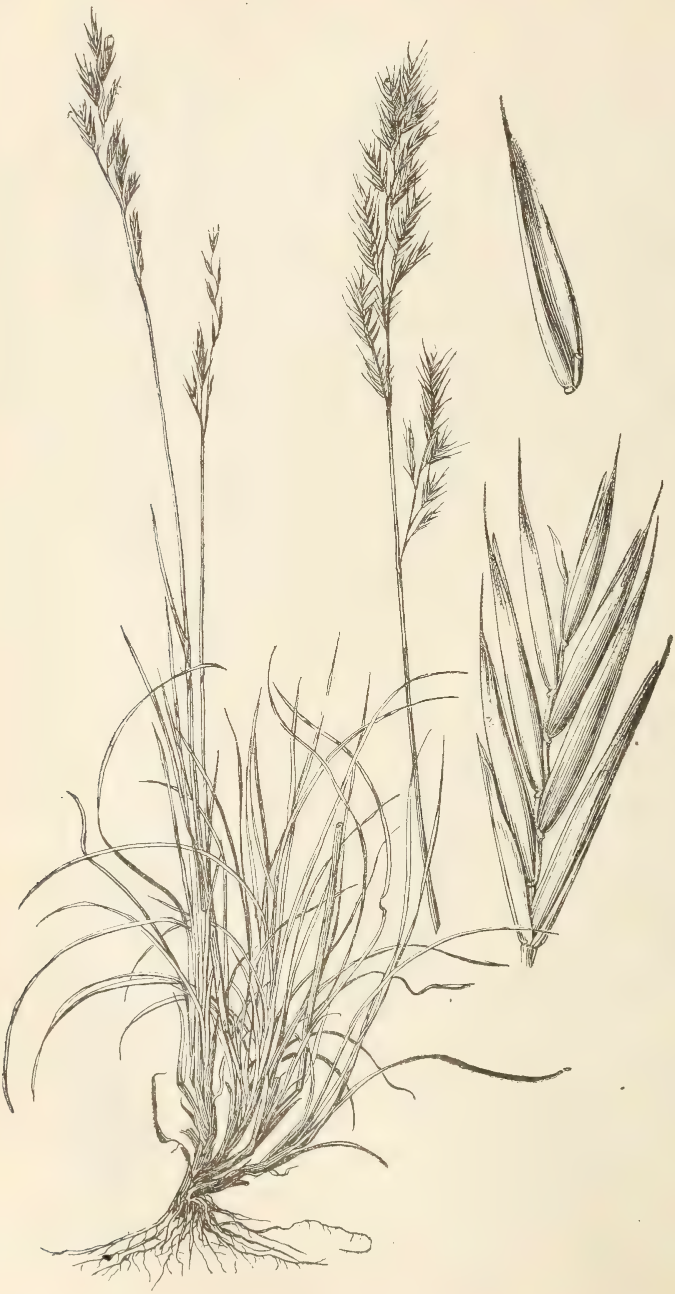


FIG. 6.—Red fescue, *Festuca rubra*. Plant, × ½; spikelet and floret, × 5.

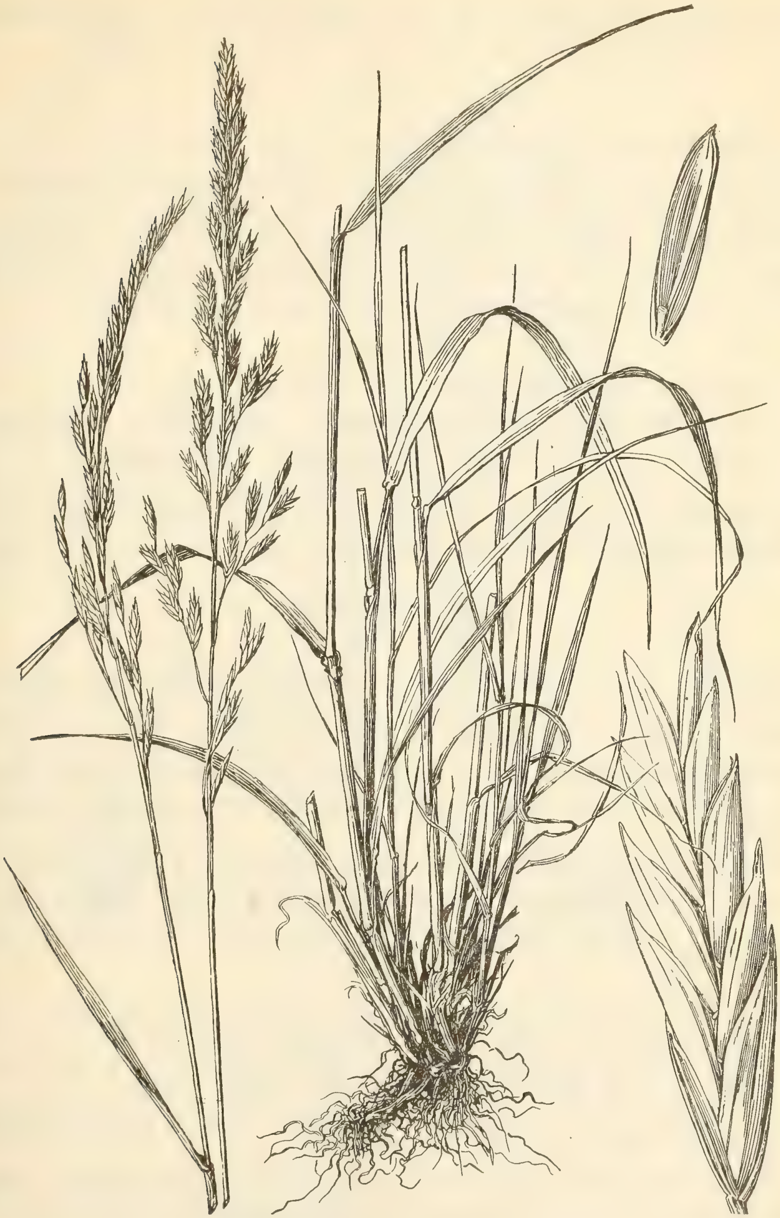


FIG. 7.—Meadow fescue, *Festuca elatior*. Plant, × ½; spikelet and floret, × 5.

commonly cultivated, usually called meadow fescue, is 2 or 3 feet tall and has a nearly simple panicle, sometimes racemose above and slightly branched at the base. In eastern Kansas the incorrect name English bluegrass is sometimes applied to this species.

For a revision of the species of Festuca found in North America, see Piper, Contr. U. S. Nat. Herb. **10**:1–48, pl. 1–15. 1906.

Scleropoa Griseb., Spicil. Fl. Rumel. **2**:431. 1844.

The one species, *Scleropoa rigida* (L.) Griseb., a native of southern Europe, is sparingly introduced in the United States, mostly as a ballast plant. It is a low annual with racemes of spikelets resembling those of Puccinellia. The glumes are 1-nerved, the lemmas convex on the back and obscurely nerved. The type is *Poa rigida* L.

Brachypodium Beauv., Ess. Agrost. 100, 155. 1812.

One species, *Brachypodium distachyon* (L.) Beauv., of Europe, has been found on ballast at Portland, Oreg., and Camden, N. J. It is a low tufted annual, with stiff culms ending in a raceme of 1 to few short-pediceled, many-flowered cylindric spikelets, the awned lemmas rounded on the back, the paleas stiffly ciliate on the keels.

4. PANICULARIA Heister.

(*Glyceria* R. Br.)

Spikelets few to many flowered, subterete or slightly compressed, the rachilla disarticulating above the glumes and between the florets; glumes unequal, short, obtuse or acute, usually scarious, mostly 1-nerved; lemmas broad, convex on the back, firm, usually obtuse, awnless, scarious at the apex, 5 to 9 nerved, the nerves parallel, usually prominent.

Usually tall aquatic or marsh grasses, with flat blades, closed or partly closed sheaths, and open or contracted panicles. Species about 35, in the temperate regions of both hemispheres; 16 species in the United States.

Type species: *Poa aquatica* L.

Panicularia Heister; Fabr., Enum. Pl. Hort. Helmst., ed. 2, 373. 1763. The genus is based on the species that Linnæus named *Poa aquatica*.

Festucaria Heister; Fabr., Enum. Pl. Hort. Helmst., ed. 2, 374. The genus is based on the species that Linnæus named *Festuca fluitans*.

Glyceria R. Br., Prodr. Fl. Nov. Holl. 179. 1810. Based on *Festuca fluitans* L.

Nevroloma Raf., Journ. de Phys. **89**: 106. 1819. "Type, le Briza canadensis de Michaux." This is *Panicularia canadensis*.

Our species are divided into two rather well marked groups. One group, consisting of five species, has linear spikelets usually as much as 1 cm. long. These species are represented by *Panicularia fluitans*, the type of Festucaria and Glyceria. The group to which *P. aquatica* belongs has ovate or oblong spikelets usually not over 5 mm. long.

The commonest species is *Panicularia nervata* (Willd.) Kuntze (fig. 8), with small prominently 7-nerved spikelets in open panicles. *Panicularia canadensis* (Michx.) Kuntze has larger less prominently

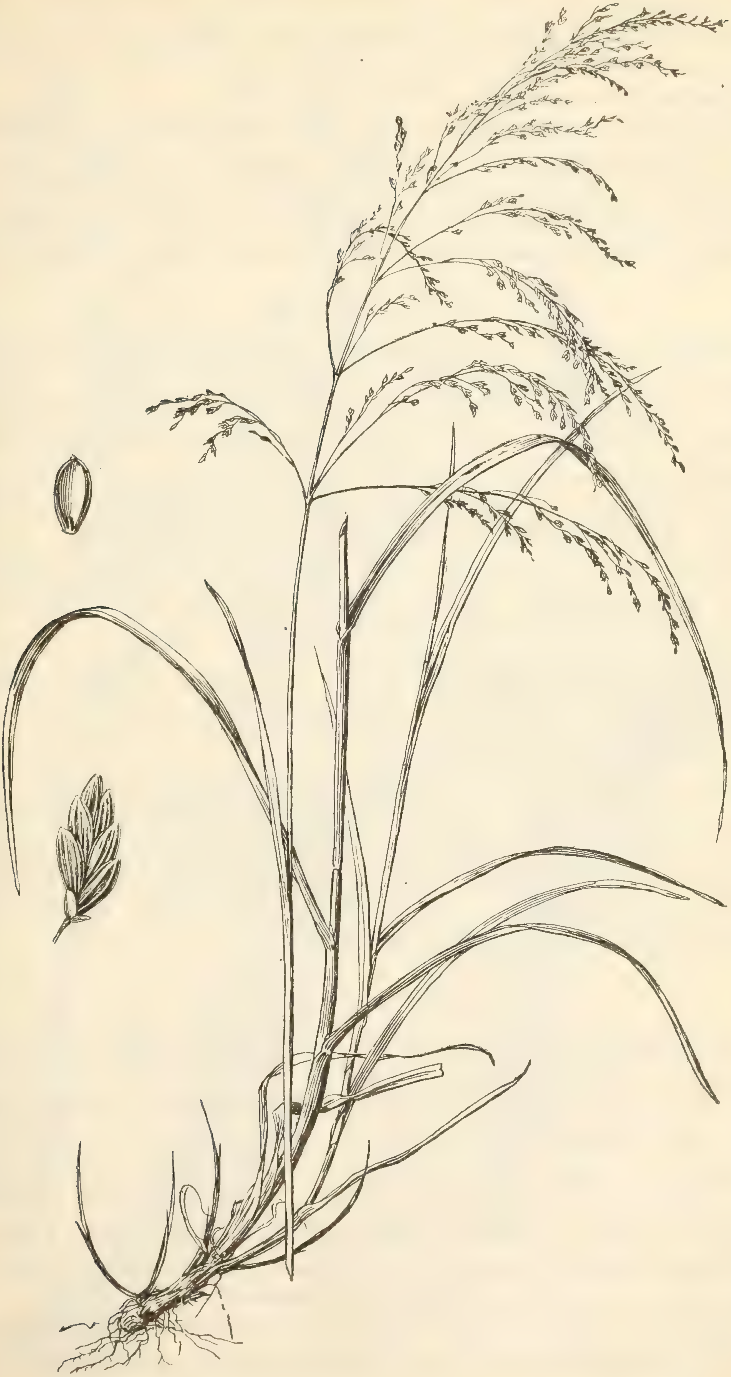


FIG. 8.—Manna grass, *Panicularia nervata*. Plant, × ½; spikelet and floret, × 5.

nerved spikelets. *Panicularia grandis* (S. Wats.) Nash has very large panicles of oblong spikelets, the lemmas prominently 7-nerved. *Panicularia pauciflora* (Presl) Kuntze, found in the western mountains, has 5-nerved lemmas and rather small panicles.

The species are sometimes called manna grass and fowl meadow grass. They are all excellent forage grasses, but usually form no very important part of the grazing because they are limited to swampy regions. Hydrocyanic acid has been found in *Panicularia nervata*, and some cases of cattle poisoning have been ascribed to it.[1]

5. PLEUROPOGON R. Br.

Spikelets several to many flowered, linear, the rachilla disarticulating above the glumes and between the florets; glumes unequal, membranaceous or subhyaline, scarious at the somewhat lacerate tip, the first 1-nerved, the second obscurely 3-nerved; lemmas membranaceous, 7-nerved, with a round indurate callus at base, the apex entire or 2-toothed, the midnerve extending into a short mucro or into an awn; palea 2-keeled, the keels winged on the lower half.

Soft annuals or perennials, with flat blades and loose racemes of rather large spikelets. Species three, one in the arctic region and two on the Pacific coast of the United States.

Type species: *Pleuropogon sabinii* R. Br.

Pleuropogon R. Br., Suppl. App. Parry's Voy. 189, pl. D. 1823. A single species described and figured.

Lophochlaena Nees, in Taylor, Ann. Nat. Hist. **1**: 283. 1838. Type *L. californica,* the only species described.

Our species are found in bogs and wet meadows. One, *Pleuropogon californicus* (Nees) Benth. (fig. 9), an annual with ascending spikelets, is confined to California. The other, *P. refractus* (Gray) Benth., a perennial with drooping spikelets, is found from northern California to Washington. They are palatable grasses, but occur too infrequently to be of economic value.

6. PUCCINELLIA Parl.

Spikelets several-flowered, usually terete or only slightly flattened, the rachilla disarticulating above the glumes and between the florets; glumes unequal, shorter than the first lemma, obtuse or acute, rather firm, often scarious at the tip, the first 1-nerved or sometimes 3-nerved, the second 3-nerved; lemmas usually firm, rounded on the back, obtuse or acute, rarely acuminate, usually scarious and often erose at the tip, glabrous or puberulent toward the base, 5-nerved, the nerves parallel, obscure or indistinct, rarely rather prominent; palea about as long as the lemma or somewhat shorter.

Annual, or usually perennial, low pale smooth cespitose grasses, with narrow or open panicles. Species about 25, mostly along coasts

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[1] Alsberg and Black. Journ. Biol. Chem. **21**: 601. 1915.

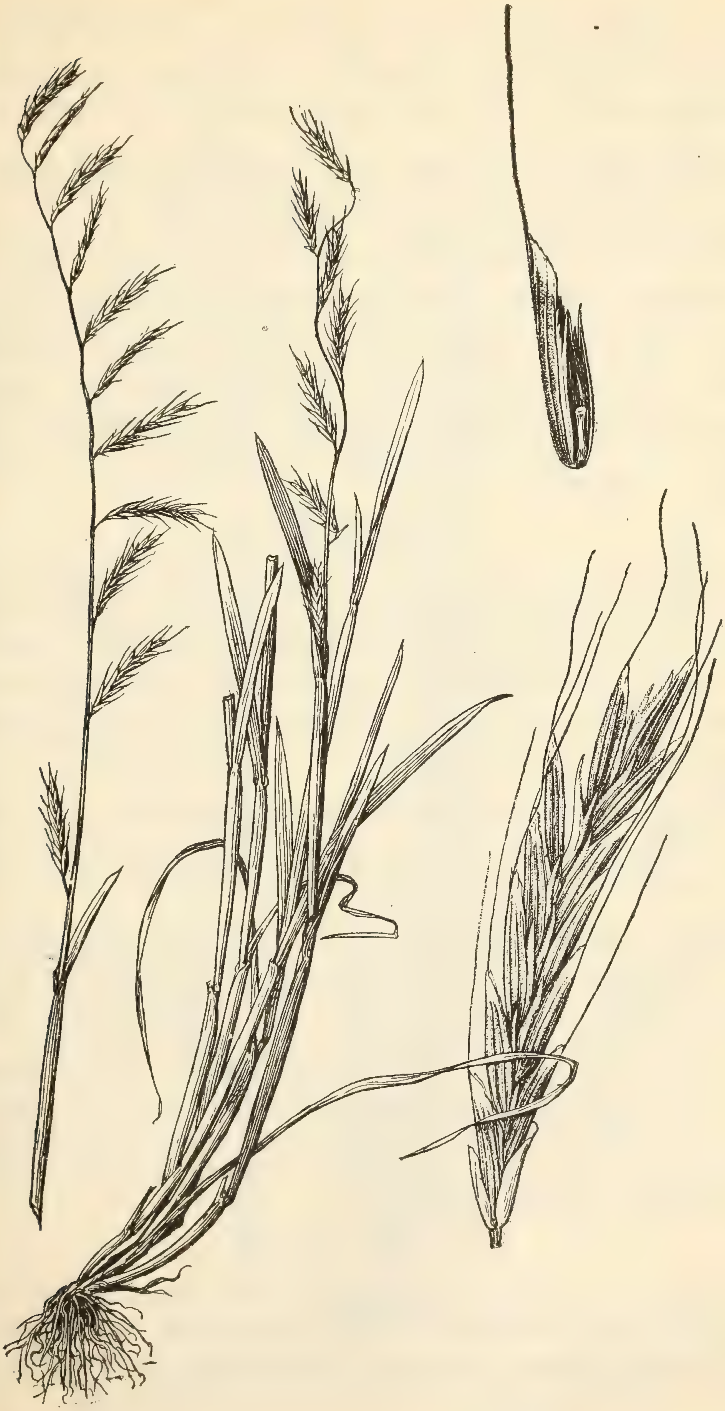

FIG. 9.—*Pleuropogon californicus.* Plant, × ½; spikelet, × 3; floret, × 5.

and on interior alkali soil of the cool and arctic regions of the Northern Hemisphere; about 12 species in the United States, on the Atlantic coast south to Delaware, on the Pacific coast south to Point Reyes, and in the western interior south to New Mexico.

Type species: *Poa distans* L.

Puccinellia Parl., Fl. Ital. 1: 366. 1848. Parlatore describes 4 species, *P. distans* (L.) Parl., *P. festucaeformis* (Host) Parl., *P. gussonii* Parl., and *P. maritima* (Huds.) Parl. The first is selected as the type.

Atropis Rupr., in Griseb. in Ledeb. Fl. Ross. 4: 388. 1853. Based upon Poa, section Atropis Rupr.,[1] of which the type and only species is *Poa distans* L.

Puccinellia differs from Poa in the rounded lemmas with indistinct and parallel nerves. The species are mostly confined to the brackish marshes of the coast. One species, *Puccinellia nuttalliana* (Schult.) Hitchc. (*P. airoides* (Nutt.) Wats. and Coult.) (fig. 10), is common in alkaline soils of the interior from Minnesota to Washington and south to New Mexico. This species furnishes considerable forage where it is common.

7. FLUMINEA Fries.

(*Scolochloa* Link.)

Spikelets 3 to 4 flowered, the rachilla disarticulating above the glumes and between the florets; glumes nearly equal, somewhat scarious and lacerate at summit, the first 3-nerved, the second 5-nerved, about as long as the first lemma; lemmas firm, rounded on the back, villous on the callus, 7-nerved, the nerves rather faint and unequal, extending into a scarious lacerate apex; palea narrow, flat, about as long as the lemma.

Tall perennials, with succulent rhizomes, flat blades, and spreading panicles. Species two, one in eastern Siberia, the other in northern Eurasia and northern North America, extending south to Iowa.

Type species: *Festuca borealis* Mert. and Koch.

Scolochloa Link, Hort. Berol. 1: 136, 1827, not Scolochloa Mert. and Koch. 1823. Based on *Arundo festucacea* Willd. (*Scolochloa festucacea* Link), the only species described. Scolochloa Mert. and Koch is based on *Arundo donax* L.

Fluminea Fries, Summa Veg. Scand. 247. 1846. Based on *Festuca borealis*. A single species is included, its name being given as "*Festuca borealis* or *Fluminea arundinacea*." This is the same as *Scolochloa festucacea*.

Our single species, *Fluminea festucacea* (Willd.) Hitchc. (*Arundo festucacea* Willd., *Graphephorum festucaceum* Gray, *Scolochloa festucacea* (Willd.) Link) (fig. 11), is a marsh grass found from Iowa and Minnesota northward. It has some value for forage and is often a constituent of marsh hay.

8. POA L., the bluegrasses.

Spikelets 2 to several flowered, the rachilla disarticulating above the glumes and between the florets, the uppermost floret reduced or rudimentary; glumes acute, keeled, somewhat unequal, the first

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[1] Beitr. Pflanzenk. Russ. Reich. 2: 61. 1845 (Fl. Samoj. Cis.).

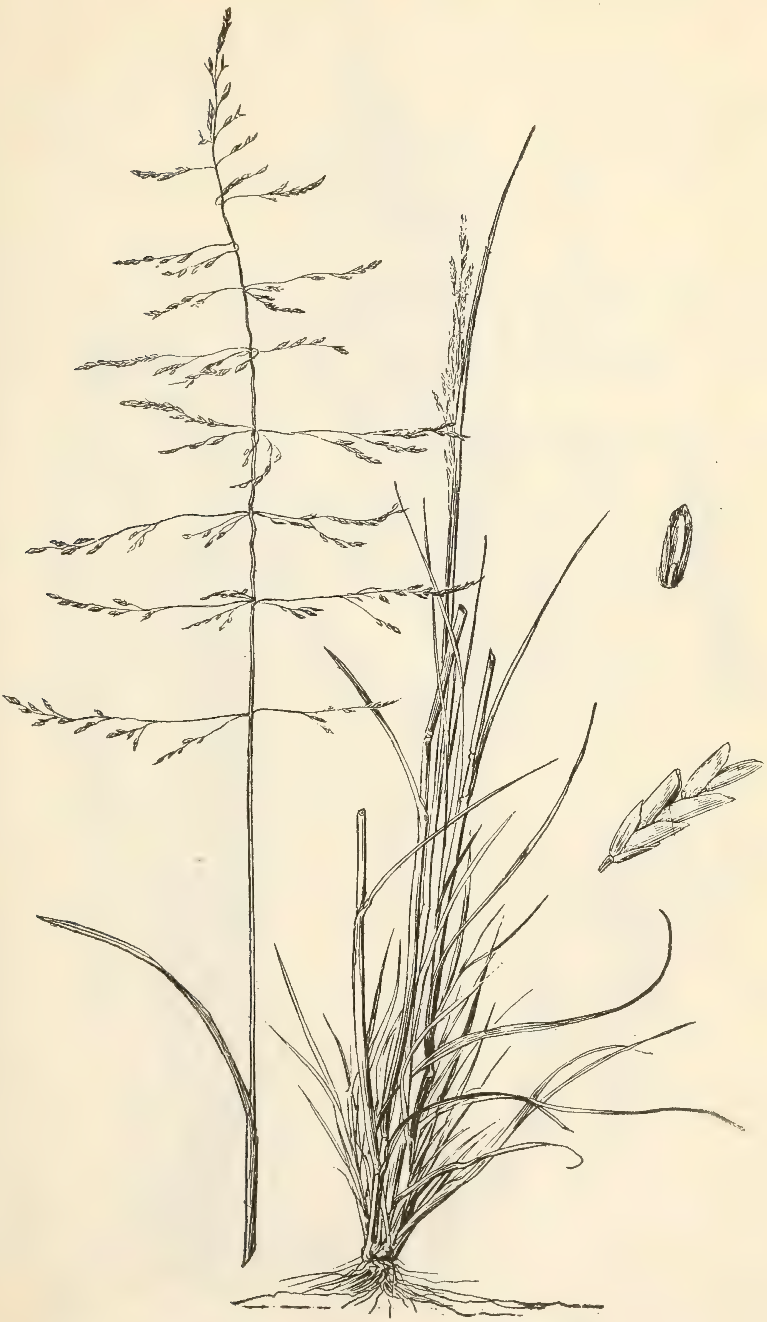


FIG. 10.—*Puccinellia nuttalliana.* Plant, × ½; spikelet and floret, × 5.

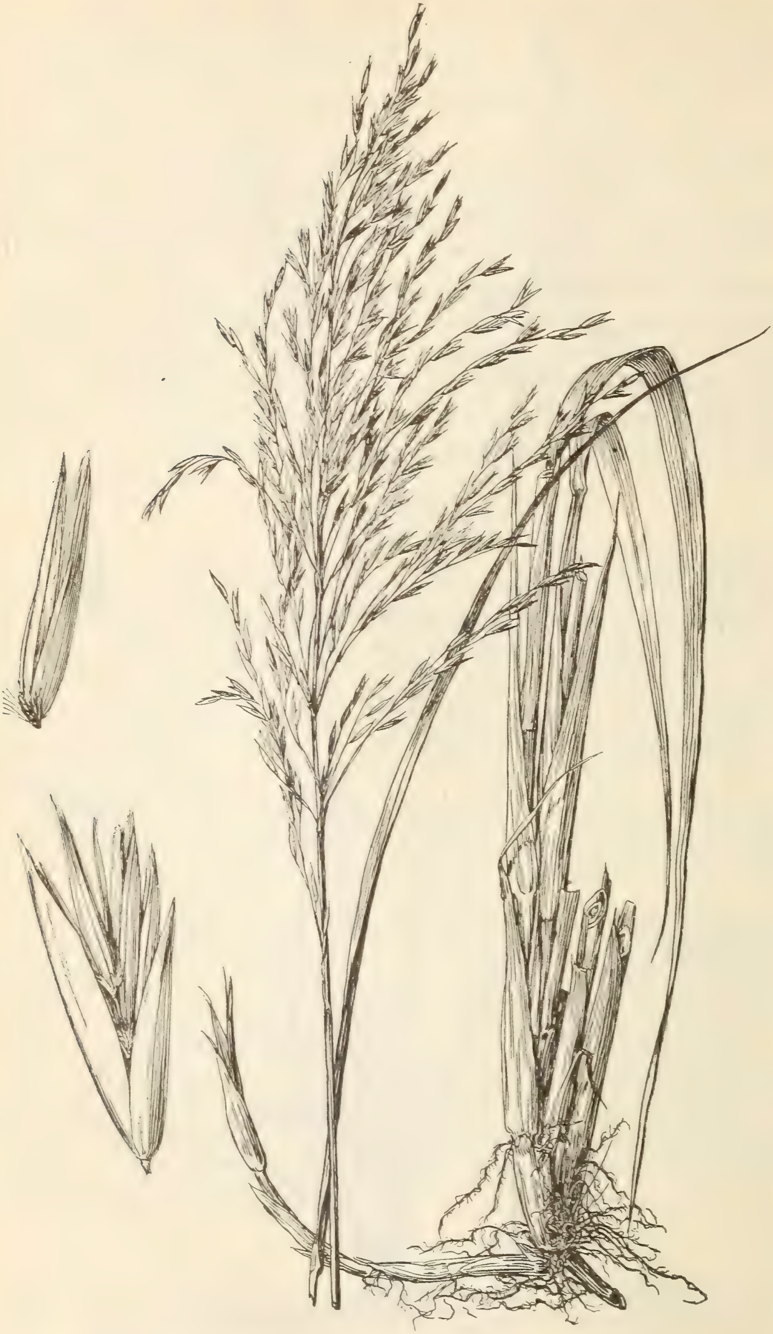


FIG. 11.—*Fluminea festucacea.* Plant, × ½; spikelet and floret, × 5.

1-nerved, the second usually 3-nerved; lemmas somewhat keeled, acute or acutish, awnless, membranaceous, often somewhat scarious at the tip, 5-nerved, the nerves sometimes pubescent.

Annual, or usually perennial, species of low or rather tall grasses, with spikelets in open or contracted panicles, the narrow blades flat or folded, ending in a navicular point. Species probably over 200, in the temperate and cool regions; about 90 in the United States, being especially numerous in the western mountains.

Type species: *Poa pratensis* L.

Poa L., Sp. Pl. 67, 1753; Gen. Pl., ed. 5, 31. 1754. Linnæus describes 17 species, 8 of which are still retained in the genus. *Poa pratensis* is chosen as the type because it is an important economic species and because it is among the species described under Poa in the Flora Lapponica. The first of the original species, *P. aquatica*, is now referred to Panicularia; *P. flava* to Triodia; *P. pilosa*, *P. amabilis*, *P. eragrostis*, *P. capillaris*, and *P. tenella* to Eragrostis; *P. malabarica* to Centotheca; *P. chinensis* to Leptochloa.

Paneion Lunell, Amer. Midl. Nat. **4**: 221. 1915. Proposed for Poa L., the word poa being a Greek common noun, meaning herb, the author regarding it "unfit as [a] generic name."

The base of the lemma sometimes bears a tuft of loose cottony hairs. A group of western species, including *Poa scabrella* (Thurb.) Benth. of California (fig. 12), *P. nevadensis* Vasey of the Great Basin, and *P. sandbergii* Vasey of the northern Rocky Mountain region, have narrow, nearly terete spikelets, in narrow panicles, the lemmas rounded on the back, glabrous, scabrous or minutely pubescent below. Several species, such as mutton grass (*P. fendleriana* (Steud.) Vasey) and its allies, *P. douglasii* Nees, and *P. arachnifera* Torr., are diœcious. A few species, such as *P. annua* L., *P. bigelovii* Vasey and Scribn. of Arizona, *P. howellii* Vasey and Scribn., and *P. bolanderi* Vasey of California, are annual. Some of the perennial species, such as *P. scabrella*, are bunch grasses, and some like *P. pratensis* and *P. compressa* produce creeping rhizomes. *Poa macrantha* Vasey, a diœcious sand-dune grass of Oregon, has spikelets as much as half an inch long.

The bluegrasses are of great importance because of their forage value, some species being cultivated for pasture and others forming a large part of the forage on the mountain meadows of the West.

The most important species of the genus is *Poa pratensis* L. (Pl. III; fig. 13) commonly known as Kentucky bluegrass, or simply bluegrass. This is a smooth perennial, with creeping rhizomes, erect culms 1 to 3 feet high, soft flat or folded blades and open pyramidal panicles 2 to 4 inches long, the lower branches in a whorl of usually 5, the spikelets mostly 4 to 6 flowered, the florets cobwebby at base, the keel and marginal nerves villous. Bluegrass is a native of Europe, but is widely naturalized in the cooler parts of this country and is cultivated for pasture and for lawns. It is the standard pasture grass in the humid regions of the United States where the soil contains plenty of lime.

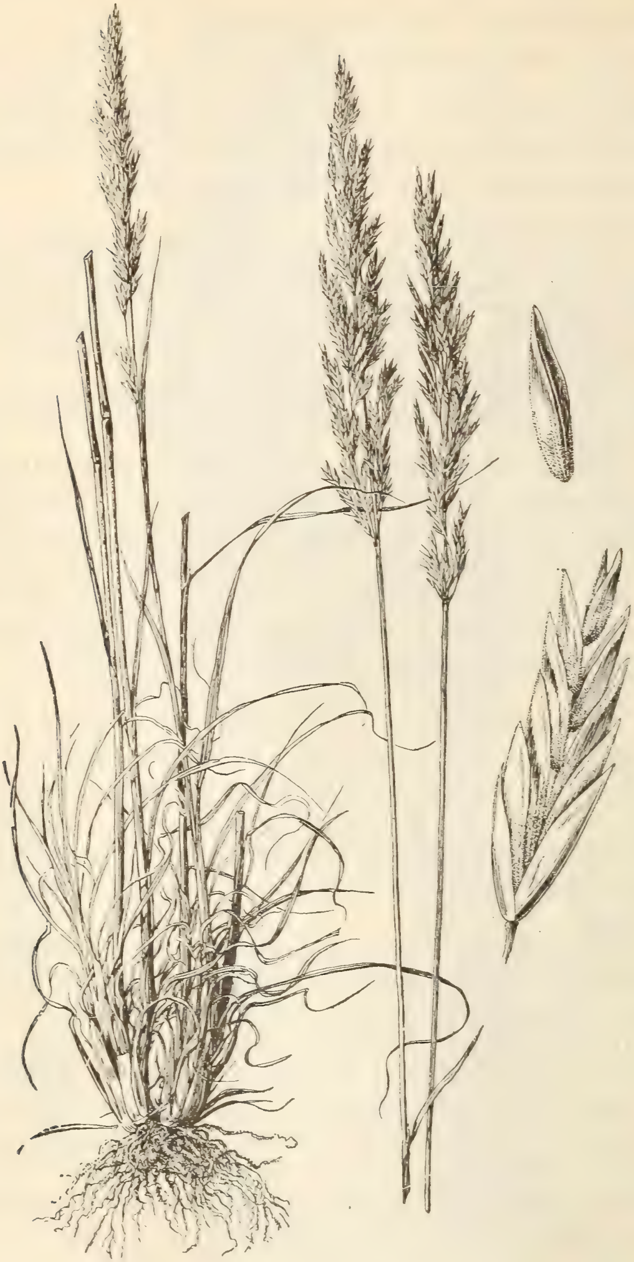
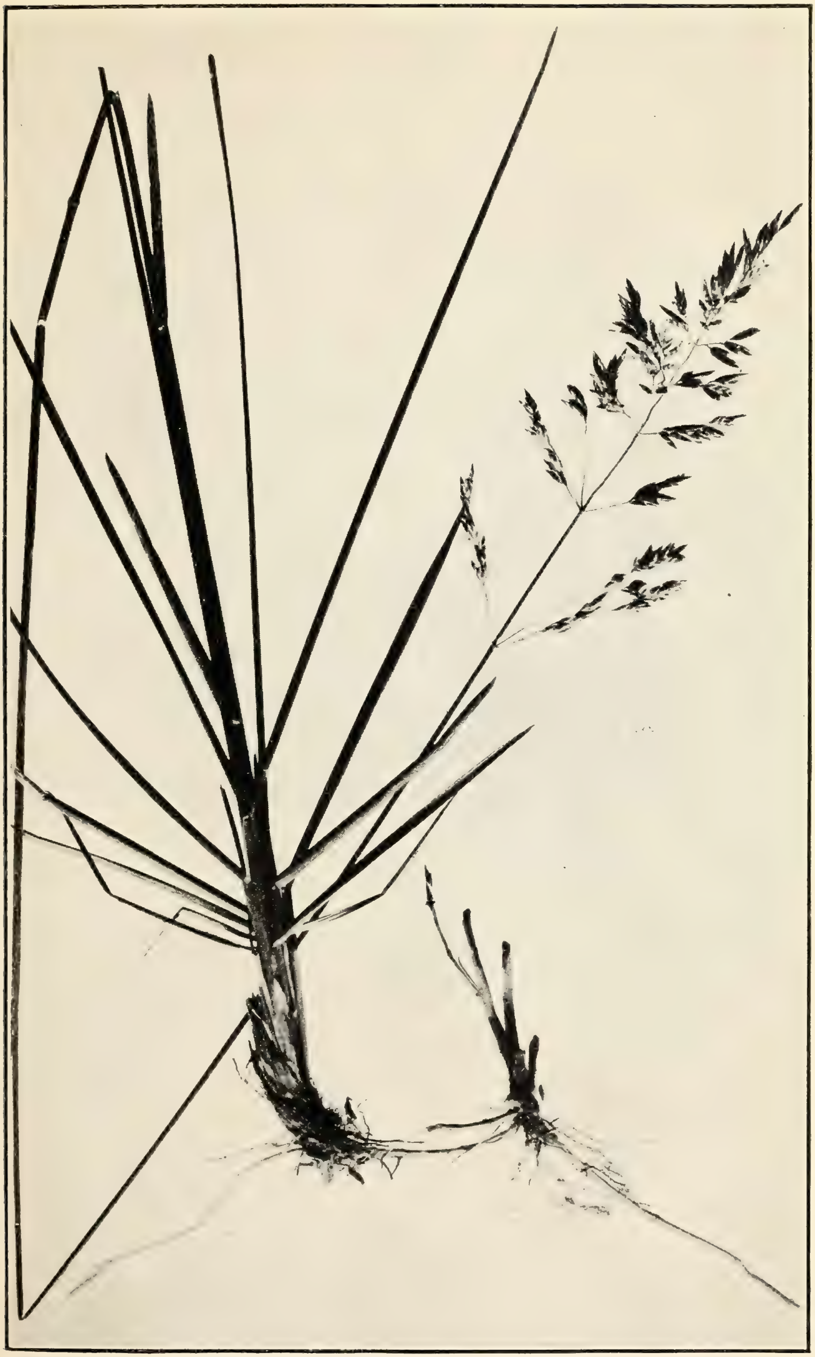
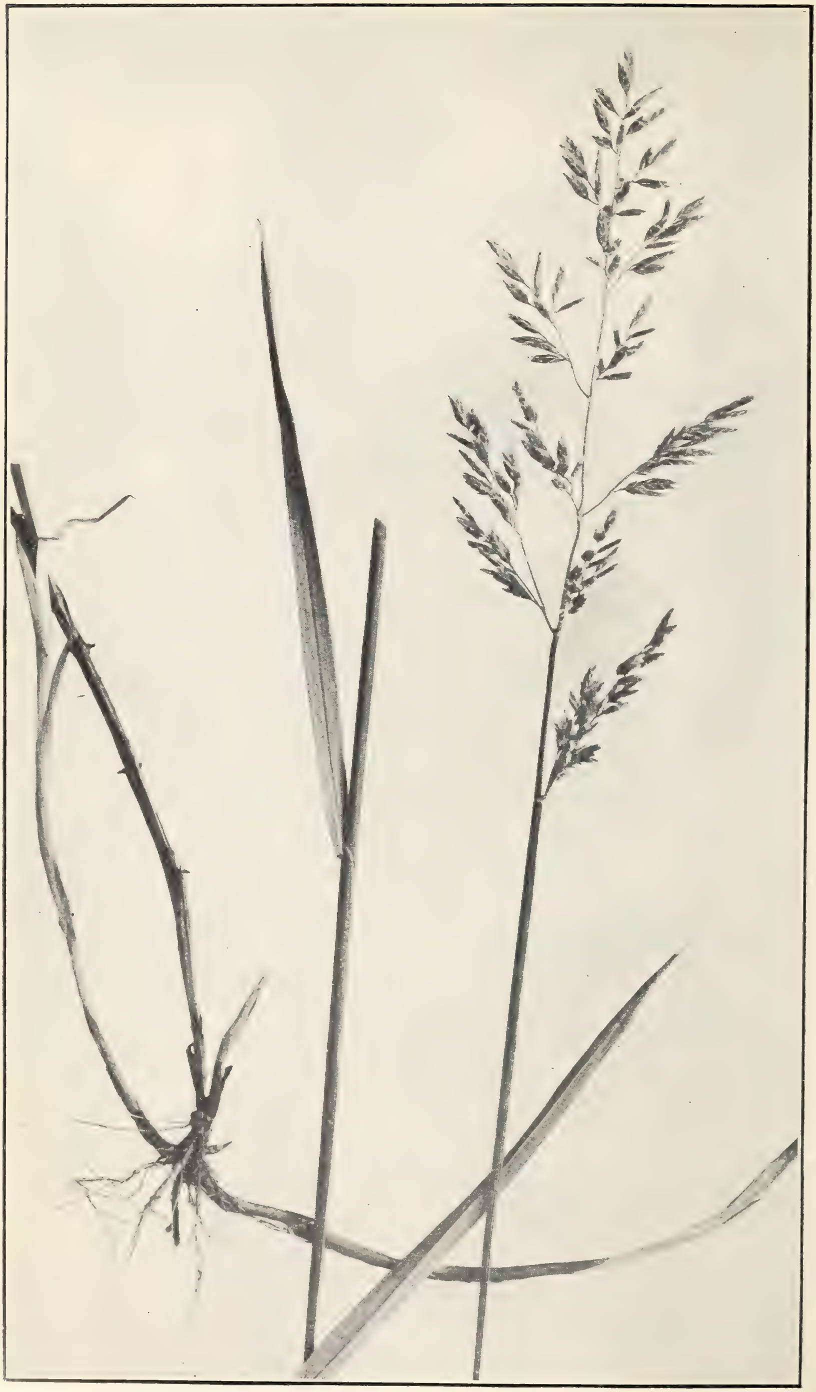


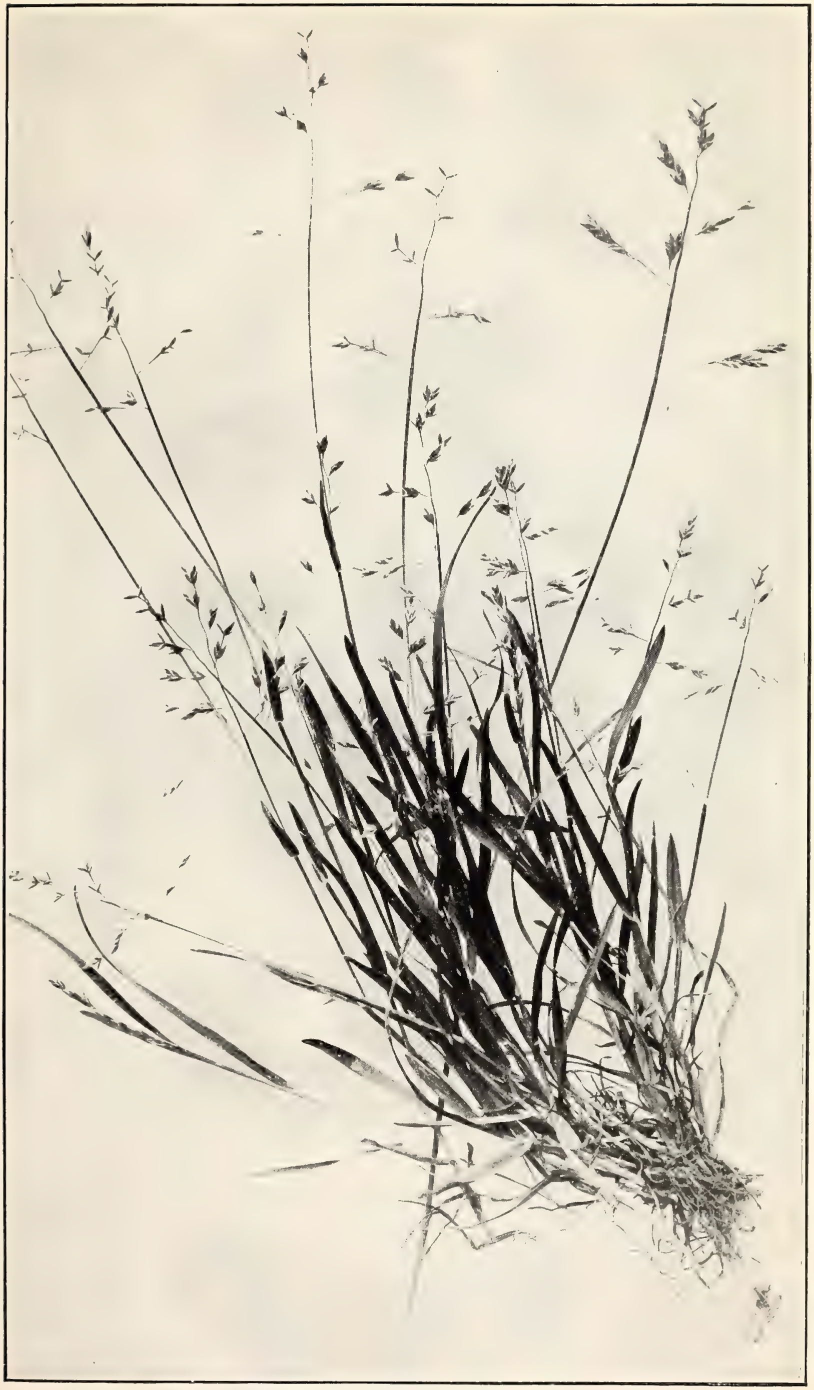
FIG. 12.—*Poa scabrella.* Plant, × ½; spikelet and floret, × 5.



KENTUCKY BLUEGRASS (POA PRATENSIS).



CANADA BLUEGRASS (POA COMPRESSA) IN FLOWER.



ANNUAL BLUEGRASS (POA ANNUA).

UNIOLA LATIFOLIA.

A tuft removed from the near-by woods and photographed in the open. A native species worthy of cultivation for ornament.

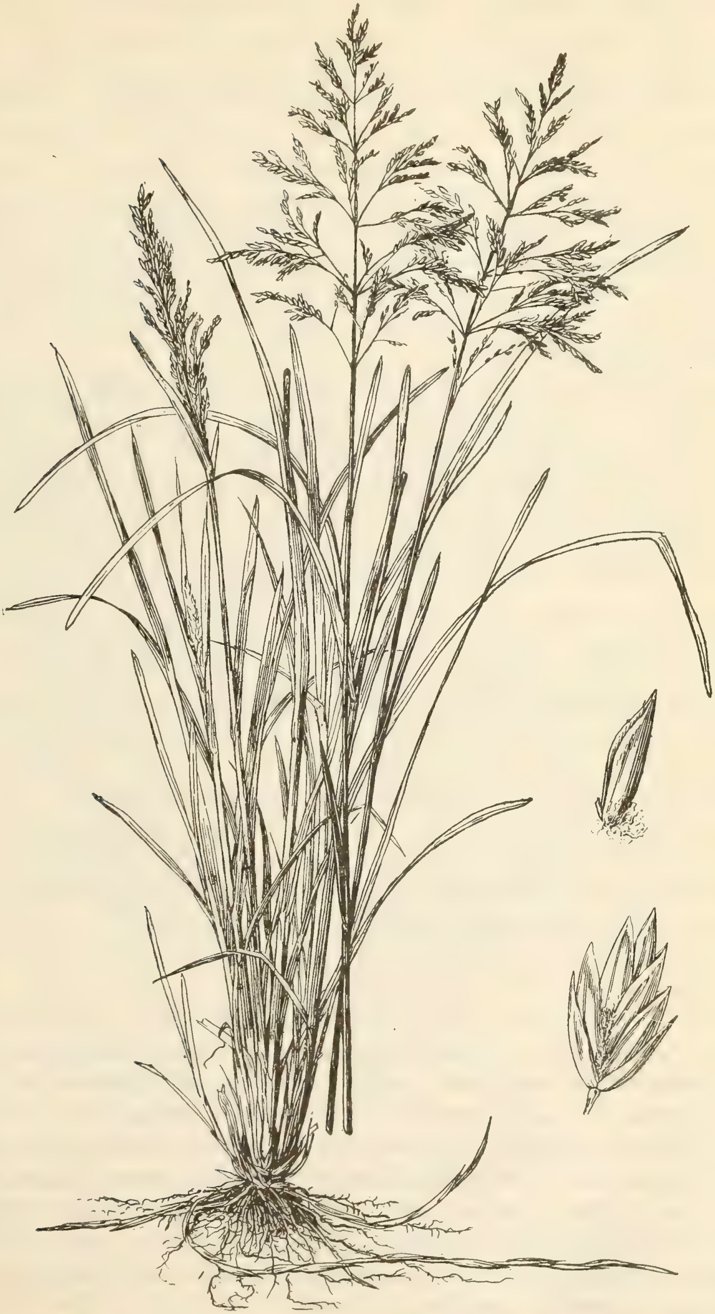


FIG. 13.—Bluegrass, *Poa pratensis*. Plant, × ½; spikelet and floret, × 5.

The name Kentucky bluegrass has been used because in Kentucky the bluegrass pastures have been a prominent feature of the agriculture of the State. In the northern portion of its range it is usually called June-grass. Bluegrass flourishes as far west as eastern Nebraska and as far south as Virginia and in the mountains to northern Alabama. In the valleys of the western mountains and in the humid region of the Pacific coast, from northern California to British Columbia, bluegrass is the common pasture grass. In the regions where bluegrass is used for pasture it is the standard lawn grass. By liming the soil and by artificial watering bluegrass may be grown for lawns beyond the limits outlined above, but it can not be made to thrive in the warmer parts of the Southern States or in the arid regions of the Southwest.

Poa compressa L. (Pl. IV), cultivated under the name of Canada bluegrass, is of some commercial importance, being grown in the region that is adapted to the growth of Kentucky bluegrass, but it is used chiefly on sterile sandy or clay soils where the latter species does not thrive. Canada bluegrass differs from Kentucky bluegrass in its blue-green color, distinctly compressed stems, and narrow less-branched panicles. It produces abundant rhizomes that throw up numerous scattered stems, mostly 6 to 15 inches tall, these being usually solitary rather than tufted. On account of its wiry, compressed stems it is called in some localities wire-grass and flat-stem.

Two other species of Poa occasionally grown but of little agricultural importance are *Poa trivialis* L., rough-stalked meadow grass, a species lacking rhizomes, but resembling *P. pratensis* in its panicle, distinguished easily by its backwardly roughened sheaths; and *Poa palustris* L. (*P. triflora* Gilib., *P. serotina* Ehrh.) known to seedsmen as fowl meadow grass, a smooth, rather tall, tufted grass, differing from bluegrass in the absence of rhizomes, in the larger more open panicle, and in the smaller, 2 to 4 flowered spikelets.

Poa arachnifera Torr., Texas bluegrass, has been used in some of the Southern States as a winter pasture grass and as a lawn grass. It is an erect diœcious grass, 1 to 2 feet high, with strong rhizomes and narrow panicles, 2 to 4 inches long, the staminate spikelets glabrous, the pistillate spikelets with a copious tuft of woolly hairs at the base of the florets. Texas bluegrass is a native of Oklahoma and Texas.

Poa annua L., annual bluegrass (Pl. V), is a low, soft, light-green, annual grass that is frequently found as a weed in lawns and gardens. It thrives in the spring or even in the winter in southerly regions, forming fine light-green patches, which die out later in the season, leaving unsightly spots. *Poa annua* is a native of Europe, but is widely introduced in America.

Several species are important range grasses. Malpais bluegrass (*Poa scabrella*), a bunch grass, with slightly roughened sheaths and narrow panicles of cylindric spikelets, the lemmas pubescent below, is common at lower altitudes in California. Mutton grass (*P. fendleriana*) is important in the Southwest. Little bluegrass (*P. sandbergii*), differing from malpais bluegrass in having smooth sheaths, is common at medium altitudes (2,000 to 8,000 feet) throughout the Northwest.

9. BRIZA L., the quaking grasses.

Spikelets several-flowered, broad, often cordate, the florets crowded and spreading horizontally, the rachilla glabrous, disarticulating above the glumes and between the florets, the uppermost floret reduced; glumes about equal, broad, papery-chartaceous, with scarious margins; lemmas papery, broad, with scarious, spreading margins, cordate at base, several-nerved, the nerves often obscure, the apex in our species obtuse or acutish; palea much shorter than the lemma.

Annual or perennial, low grasses, with erect culms, flat blades, and usually open, showy panicles, the pedicels in our species capillary, allowing the spikelets to vibrate in the wind. Species about 20, the greater number South American. The three species found in the United States are introductions from Europe and occur here as occasional weeds in waste places.

Type species: *Briza media* L.

Briza L., Sp. Pl. 70, 1753; Gen. Pl., ed. 5, 32. 1754. Linnæus describes 4 species, *B. minor*, *B. media*, *B. maxima*, and *B. eragrostis*. The first three were familiar to Linnæus as cultivated plants in the Hortus Cliffortianus, and the second, which is selected as the type species, was described in his flora of Sweden. The first three species are now retained in Briza, the last is referred to Eragrostis.

Of the three species found in this country, one, *Briza media* (fig. 14), is perennial, and two, *B. minor* and *B. maxima*, are annual. The spikelets of *B. maxima*, a species sometimes cultivated for ornament under the name quaking grass, are large and showy, half an inch long, drooping on slender pedicels. *Briza minor*, with smaller upright spikelets, is rather common on the Pacific coast.

10. ERAGROSTIS Host.

Spikelets few to many flowered, the florets usually closely imbricate, the rachilla disarticulating above the glumes and between the florets, or continuous, the lemmas deciduous, the paleas persistent; glumes somewhat unequal, shorter than the first lemma, acute or acuminate, 1-nerved, or the second rarely 3-nerved; lemmas acute or acuminate, keeled or rounded on the back, 3-nerved, the nerves usually prominent; palea 2-nerved, the keels sometimes ciliate.

Annual or perennial grasses of various habit, the inflorescence an open or contracted panicle. Species more than 100, tropical and temperate regions; 33 species in the United States, in all except the cool or mountain regions.

Type species: *Briza eragrostis* L.

Eragrostis Host, Gram. Austr. **4**: 14, pl. 24. 1809. One species is described, but no generic description is given. The genus Eragrostis was first diagnosed by Beauvois,[1] the type being *Eragrostis eragrostis*, based on *Poa eragrostis* L.

Erochloë Raf., Neogenyt. 4, 1825; Bull. Bot. Seringe **1**: 221. 1830. Rafinesque first proposed the name in 1825 but mentioned no species. In 1830 he gives the name to "Poa spectabilis seu amabilis," (*Eragrostis pectinacea* and *E. amabilis*, respectively, not the same species, as Rafinesque implies).

Acamptoclados Nash, in Small, Fl. Southeast. U. S. 139. 1903. The type, indicated on page 1327, is *Eragrostis sessilispica* Buckl., the only species described. The genus is placed in Chlorideæ on account of the sessile spikelets distant along the panicle branches.

Neeragrostis Bush, Trans. Acad. St. Louis **13**: 178. 1903. The type species is indicated, *Poa weigeltiana* Reichenb. The genus includes also *N. hypnoides* (*Eragrostis hypnoides*).

Erosion Lunell, Amer. Midl. Nat. **4**: 221. 1915. Proposed for "Eragrostis Beauv. . . . The name to be avoided, as built on another grass name."

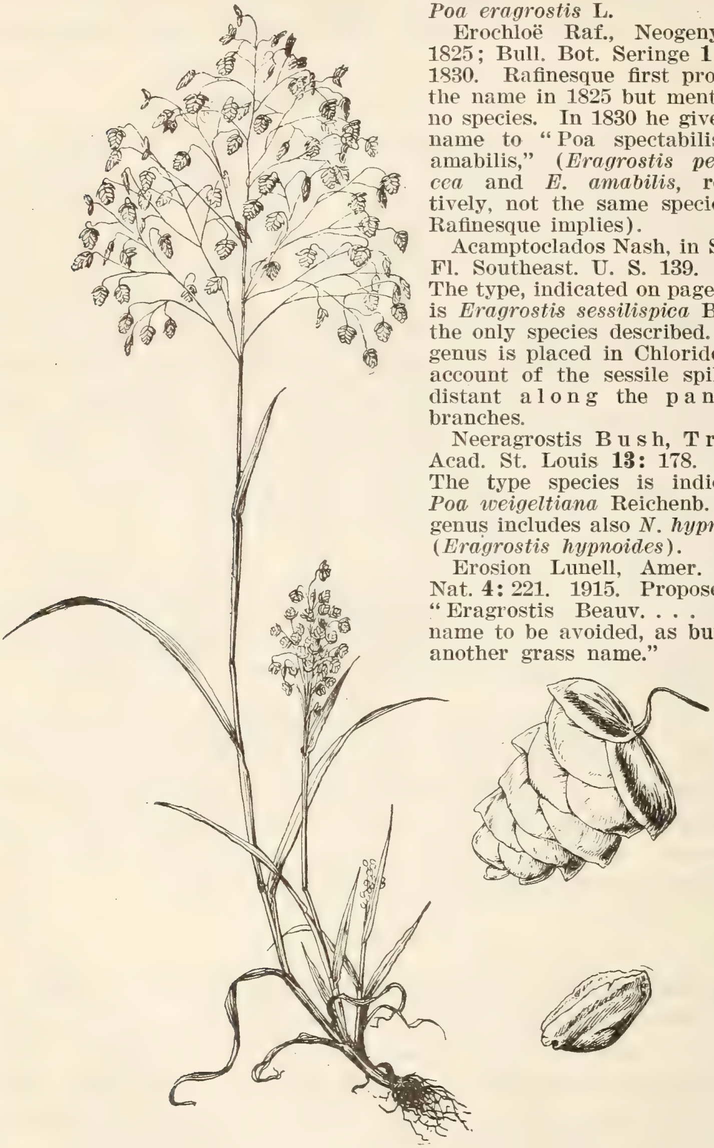


Fig. 14.—Quaking grass, *Briza media*. Plant, × ½; spikelet and floret, × 5.

In many species the rachilla is continuous and does not disarticulate as in most species of the tribe Festuceae. The grain is free and falls with the lemma, leaving the palea upon the rachilla. To this group belong two common annual weeds, *Eragrostis cilianensis* (All.) Link (*E. megastachya* (Koel.) Link, *E. major* Host), a disagreeable smelling grass (fig. 15) with rather compact panicles of large spikelets (3 mm. wide), the keels of the lemmas glandular dotted, and *E. caroliniana* (Spreng.) Scribn., with open panicles of small spikelets (about 1.5 mm. wide).

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[1] Ess. Agrost. 70, pl. 14, f. 11. 1812.

Eragrostis pectinacea (Michx.) Nees (fig. 16) is a perennial with handsome purple open panicles, which at maturity separate from the plant and tumble before the wind.

Eragrostis hypnoides (Lam.) B. S. P. is a spreading diœcious annual found on sandy river banks. *Eragrostis ciliaris* (L.) Link (fig. 17) and *E. amabilis* (L.) Wight and Arn. (*E. plumosa* Link) are tropical annuals that extend into the Gulf States. They have conspicuously ciliate paleas and disarticulating rachilla. A common perennial species in sandy soil from Kansas to Texas is *E. secundiflora* Presl (*E. oxylepis* Torr.) with contracted purple panicles, the rachilla disarticulating and the florets falling separately.

In general, the species of Eragrostis have little forage value.

11. CATABROSA Beauv.

Spikelets mostly 2-flowered, the florets somewhat distant, the rachilla disarticulating above the glumes and between the florets; glumes unequal, shorter than the lower floret, flat, nerveless, irregularly toothed at the broad truncate apex; lemmas broad, prominently 3-nerved, the nerves parallel, the broad apex scarious; palea about as long as the lemma, broad, scarious at the apex.

Aquatic perennials, with creeping bases, flat soft blades, and open panicles. Species seven, in northern Eurasia and North America, extending south to New Brunswick and Colorado; one in Chile.

Type species: *Aira aquatica* L.

Catabrosa Beauv., Ess. Agrost. 97, pl. 19, f. 8. 1812. The species illustrated is *C. aquatica*. Another name mentioned is a nomen nudum.

Catabrosa aquatica (L.) Beauv. (fig. 18) is found in mountain meadows around springs and watercourses. It is an unimportant forage grass.

12. MOLINIA Schrank.

Spikelets 2 to 4 flowered, the florets distant, the rachilla disarticulating above the glumes, slender, prolonged beyond the upper floret, and bearing a rudimentary floret; glumes somewhat unequal, acute, shorter than the first lemma, 1-nerved; lemmas membranaceous, narrowed to an obtuse point, 3-nerved; palea bowed out below, equaling or slightly exceeding the lemma.

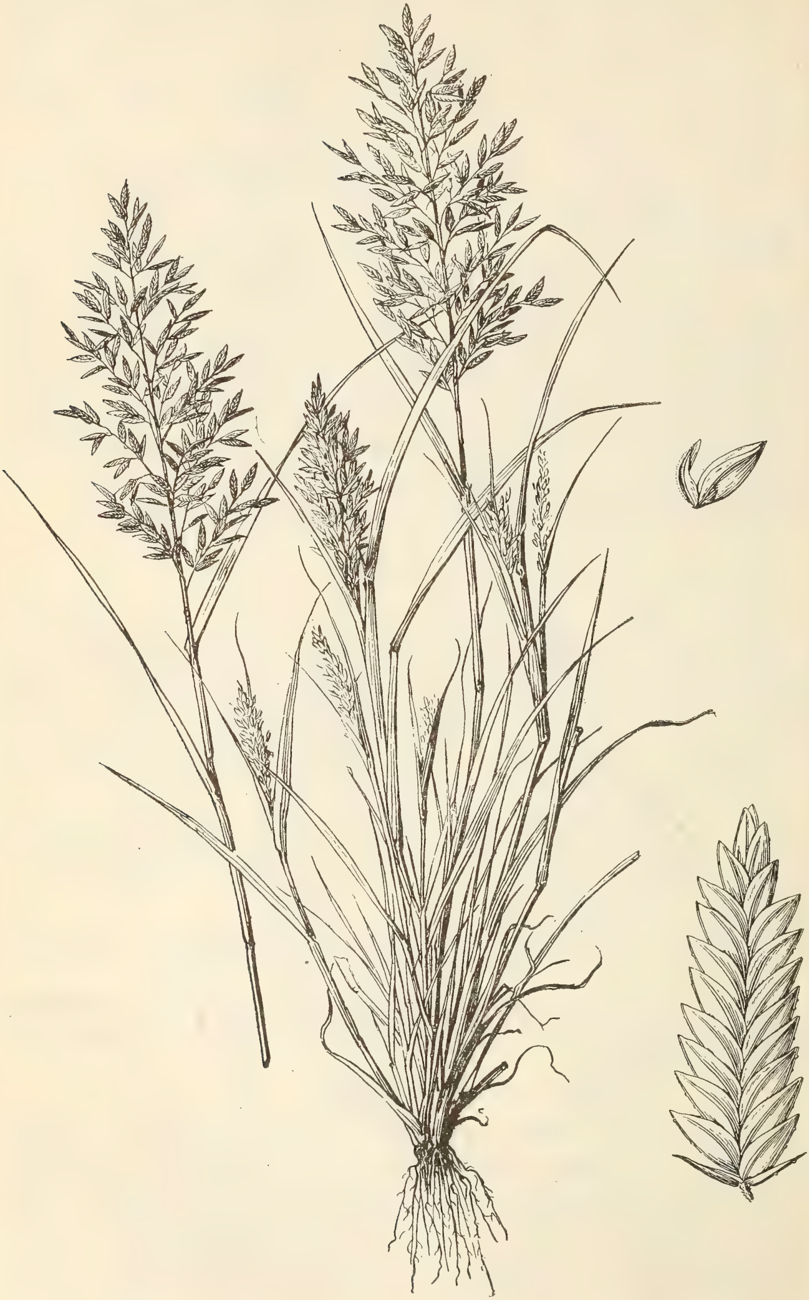

FIG. 15.—Stink-grass, *Eragrostis cilianensis*. Plant, × ½; spikelet and floret, × 5.

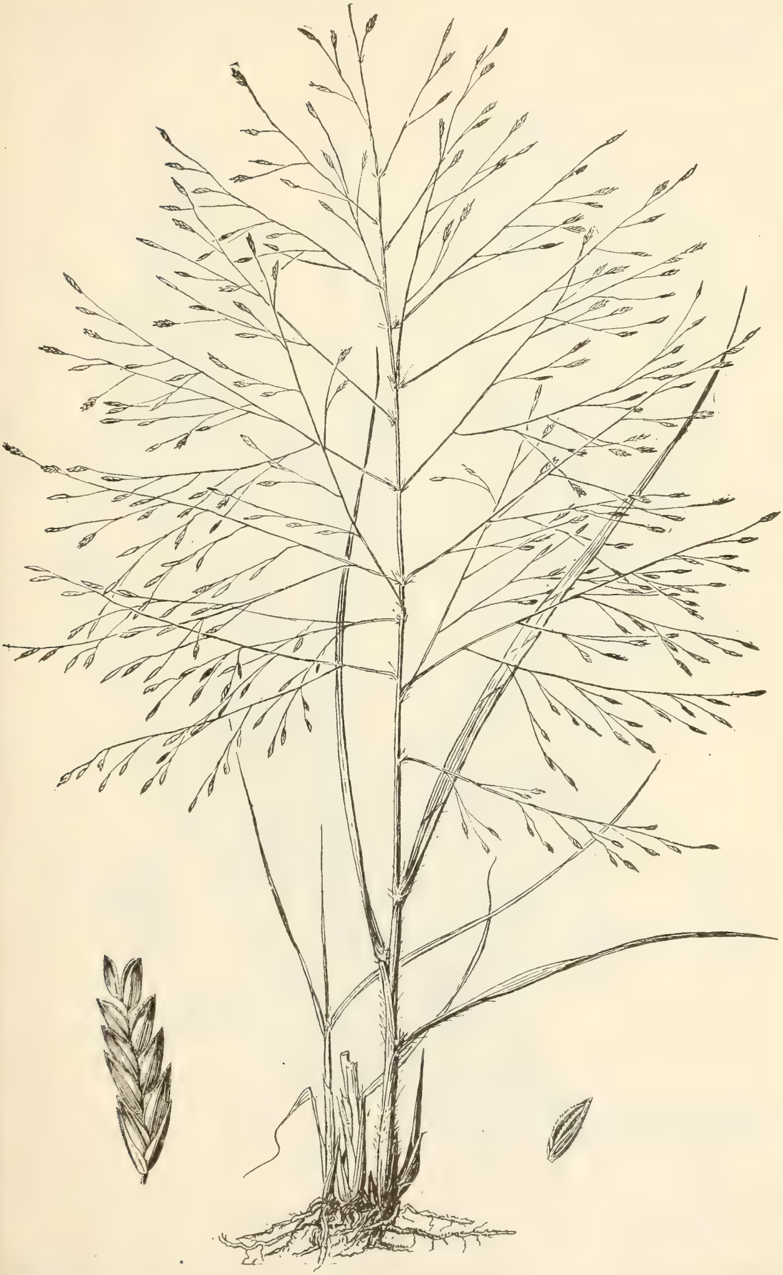

FIG. 16.—Love-grass, *Eragrostis pectinacea*. Plant, × ½; spikelet and floret. × 5.

Slender tufted perennials, with flat blades and narrow, rather open panicles. Species five, Europe and Asia; one sparingly introduced in the United States.

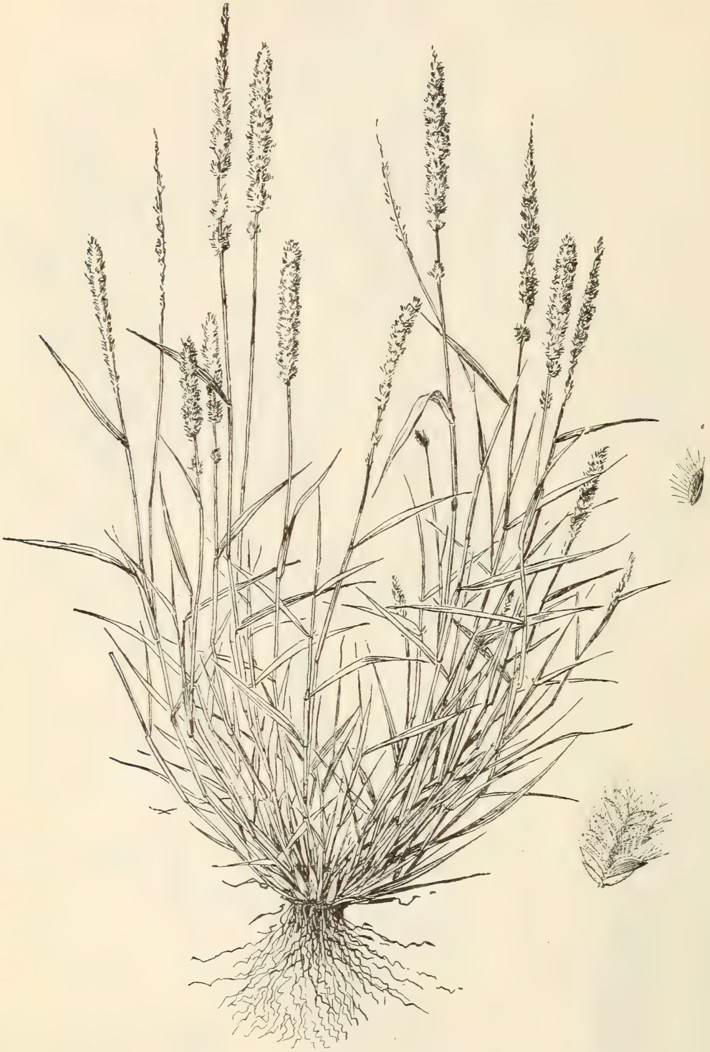

FIG. 17.—*Eragrostis ciliaris.* Plant, × ½; spikelet and floret, × 5.

Type species: *Aira caerulea* L.

Molinia Schrank, Baier. Fl. **1**: 336. 1789. A single species described, *M. varia,* of which *Aira caerulea* L. is given as a synonym.

Molinia caerulea (L.) Moench (fig. 19) is introduced in a few localities in the Eastern States from New England to Pennsylvania. In Europe this is considered to be a good forage grass. A form with striped leaves is cultivated for ornament, being used for borders.

13. DIARINA Raf.

Spikelets few-flowered, the rachilla disarticulating above the glumes and between the florets; glumes unequal, acute, shorter than the lemmas, the first 1-nerved, the second 3 to 5 nerved; lemmas chartaceous, pointed, 3-nerved, the nerves converging in the point, the upper floret reduced; palea chartaceous, 2-nerved, obtuse, at maturity the lemma and palea widely spread by the large turgid beaked caryopsis with hard shining pericarp.

Perennials, with slender rhizomes, broadly linear, flat blades, long-tapering below, and narrow, few-flowered panicles. Species two, one in eastern Asia and one in the eastern United States.

Type species: *Festuca diandra* Michx.

Diarina Raf., Med. Repos. **5:** 352. 1808. Rafinesque bases a new genus on *Festuca diandra* Michx. (not Moench, 1794). He renames the species *D. festucoides.* Beauvois[1] spells the name Diarrhena, crediting it to "Shmal" [Rafinesque-Schmalz] and renames the single species *D. americana.*

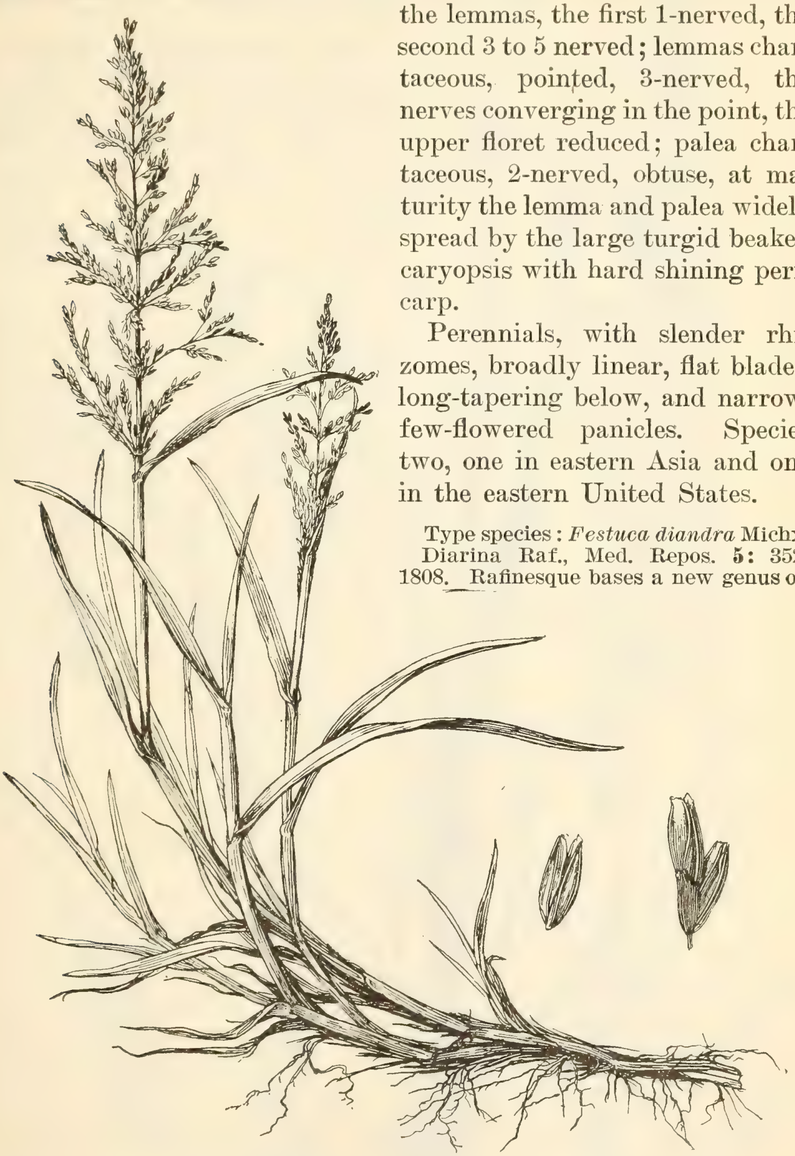

FIG. 18.—*Catabrosa aquatica.* Plant, × ½; spikelet and floret, × 5.

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[1] Ess. Agrost. 142, pl. 25, f. 1. 1812.

Korycarpus Zea; Lag., Gen. and Sp. Nov. 4. 1816. The only species described is *K. arundinaceus* Zea, which is the same as *Diarina festucoides.* Lagasca cites the reference "Ac. Matr. 1806," but there seems to be no evidence that the name Korycarpus was published earlier than 1816.

Our single species, *Diarina festucoides* Raf. (fig. 20), is found in rich woods through the eastern United States. It is of little importance as a forage grass.

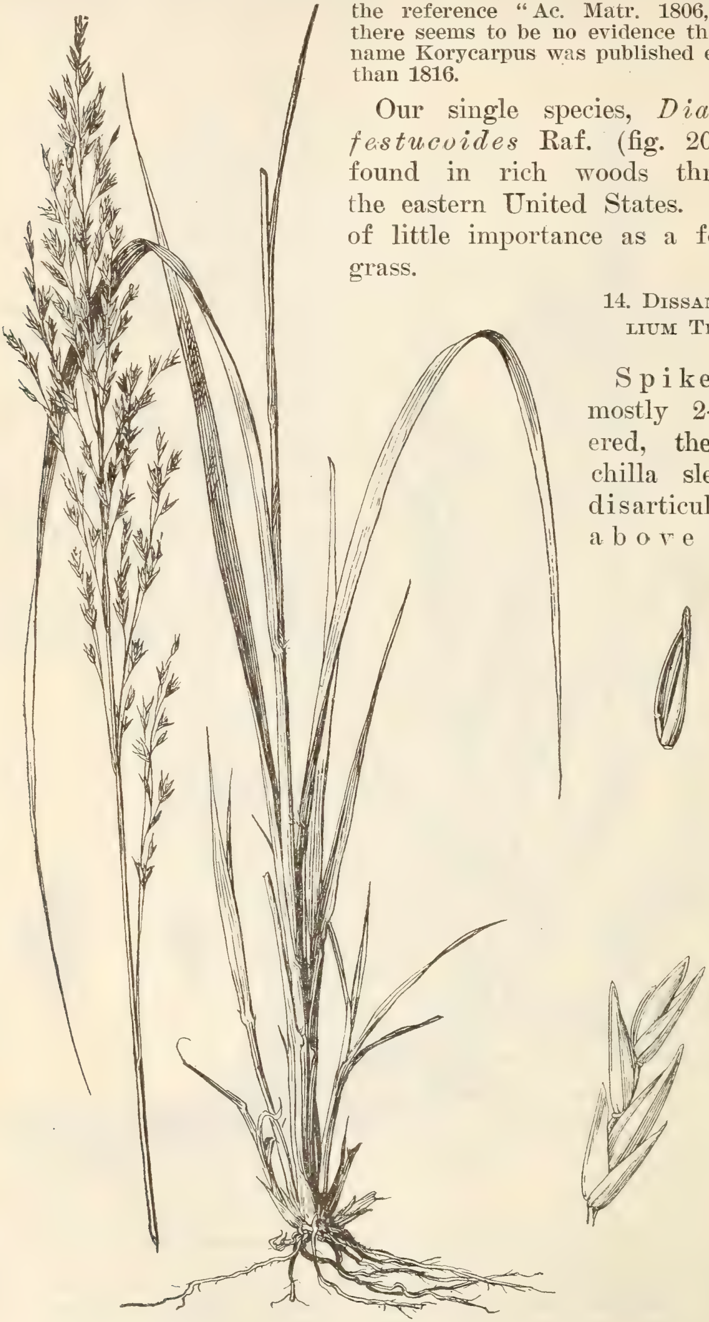


FIG. 19.—*Molinia caerulea.* Plant, × ½; spikelet and floret, × 5.

14. Dissanthelium Trin.

Spikelets mostly 2-flowered, the rachilla slender, disarticulating above the glumes and between the florets; glumes firm, nearly equal, acuminate, much longer than the lower floret, mostly exceeding all the florets, the first 1-nerved, the second 3-nerved; lemmas strongly compressed, oval or elliptic, acute, awnless, 3-nerved, the lateral nerves near the margin; palea somewhat shorter than the lemma.

Annual or perennial grasses, with narrow panicles. Species two, one in Mexico and South America, the other in California.

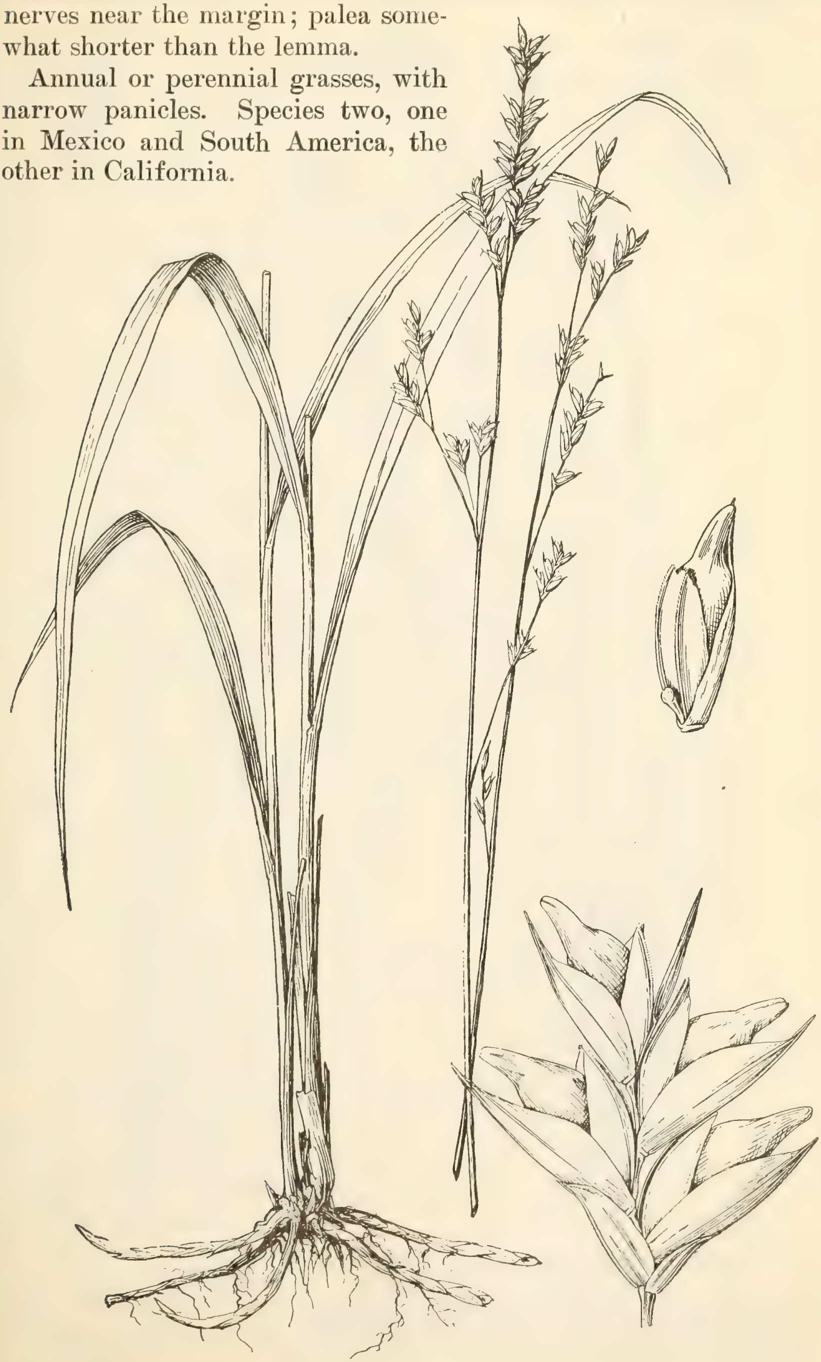


FIG. 20.—*Diarina festucoides.* Plant, × ½; spikelet and floret, × 5.

Type species: *Dissanthelium supinum* Trin.
Dissanthelium Trin., Linnæa **10**: 305. 1836. One species described.
Stenochloa Nutt., Journ. Acad. Phila. II. **1**: 189. 1848. One species described, *S. californica.*

Our Californian species, *Dissanthelium californicum* (Nutt.) Benth. (fig. 21), is an annual with flat blades and a narrow somewhat open panicle. It is a rather rare species found in southern California and the islands off the coast and has no economic value.

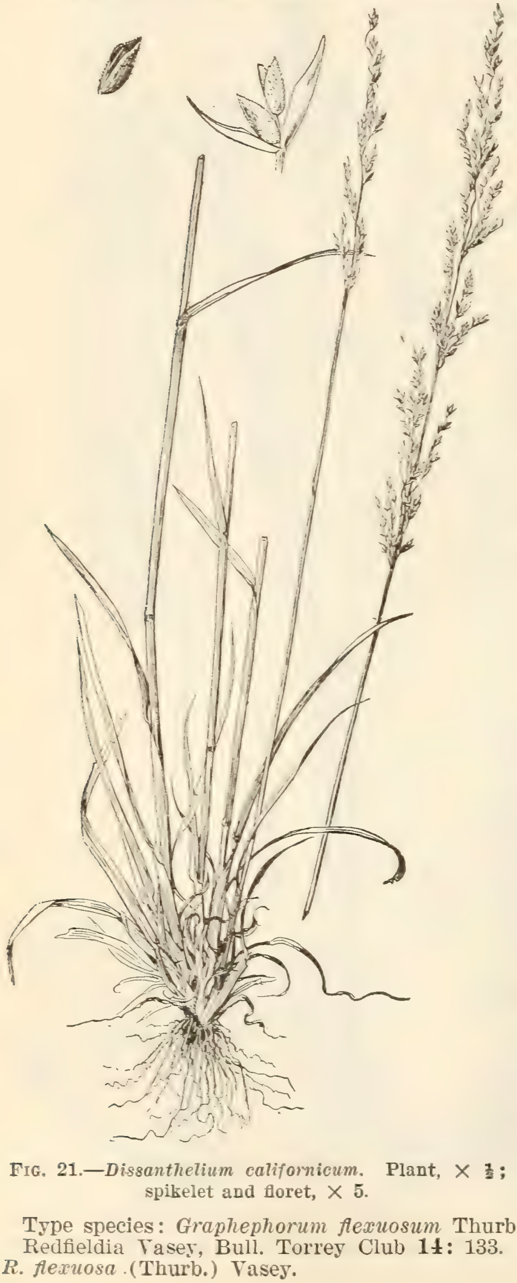


FIG. 21.—*Dissanthelium californicum.* Plant, × ½; spikelet and floret, × 5.

The second species of the genus is *Dissanthelium supinum* Trin., a low tufted perennial, with narrow, folded or convolute blades and short, densely flowered panicles. This is found on alpine summits in Mexico, Bolivia, and Peru. It has been called *Deschampsia matthewsii* Ball and *Dissanthelium sclerochloides* Fourn.

15. REDFIELDIA Vasey.

Spikelets compressed, few-flowered, mostly 3 or 4 flowered, the rachilla disarticulating above the glumes and between the florets; glumes somewhat unequal, 1-nerved, acuminate; lemma chartaceous, 3-nerved, the nerves parallel, densely villous at base; palea as long as the lemma; grain free.

A rather tall perennial, with rhizomes and a large panicle with diffuse capillary branches. Species one; sand hills of the Great Plains.

Type species: *Graphephorum flexuosum* Thurb.
Redfieldia Vasey, Bull. Torrey Club **14**: 133. 1887. One species described, *R. flexuosa* (Thurb.) Vasey.

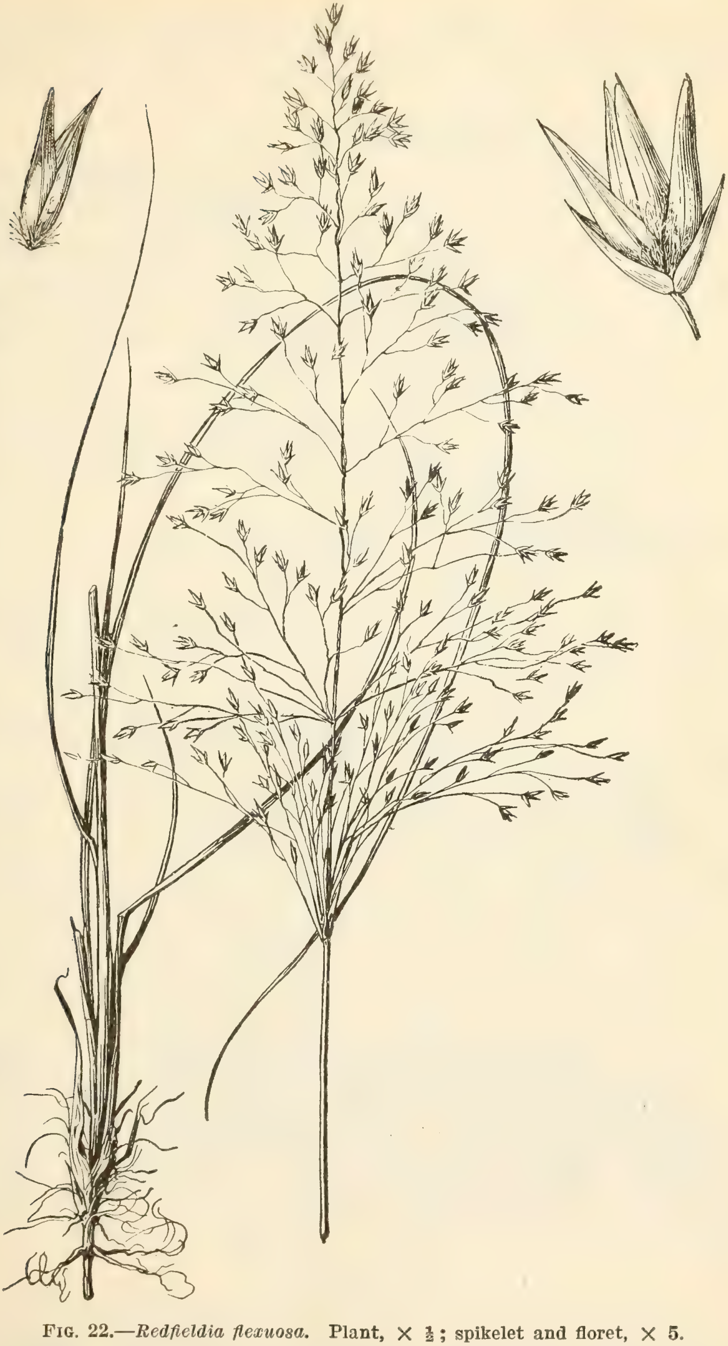


FIG. 22.—*Redfieldia flexuosa.* Plant, × ½; spikelet and floret, × 5.

Redfieldia flexuosa (fig. 22) is a gregarious sand-hill grass, one of the few species found growing in the drifting sand, which it tends to hold in place with its numerous creeping rhizomes. The species is found from South Dakota to Kansas. It has little value for forage but much value as a sand binder.

16. MONANTHOCHLOË Engelm.

Plants diœcious; spikelets 3 to 5 flowered, the uppermost florets rudimentary, the rachilla disarticulating tardily in pistillate spikelets; glumes wanting; lemmas rounded on the back, convolute, narrowed above, several-nerved, those of the pistillate spikelets like the blades in texture; palea narrow, 2-nerved, in the pistillate spikelets convolute around the pistil, the rudimentary uppermost floret inclosed between the keels of the floret next below.

A creeping wiry perennial, with clustered short subulate leaves, the spikelets at the ends of the short branches only a little exceeding the leaves. Species two, one on muddy shores of the ocean in tropical America, one in Argentina.

Type species: *Monanthochloë littoralis* Engelm.

Monanthochloë Engelm., Trans. Acad. St. Louis **1**: 1436. 1859. Only one species described.

Monanthochloë littoralis (fig. 23) is found within our limits only in southern Florida, southern Texas, and southern California, on tidal flats, sometimes covering extensive areas. Owing to the inconspicuousness of the spikelets, the flowering stage can be determined only on close examination. The species has no economic importance except as it tends to convert mud flats into permanent soil.

The leaves next the spikelet are reduced, but always present a short though well-marked blade or foliaceous tip with a distinct ligule. The branches bearing the spikelets are short and clustered. The uppermost leaf, the one nearest the spikelet, usually has no bud or branch in its axil. The leaf next below bears a bud or short branch and a well-developed prophyllum. The prophylla of branches somewhat lower may be as large as the sheath of the leaf, and the two nerves may extend into prominent foliaceous tips. As the branch develops, the prophyllum usually splits down the middle and the two halves stand one on each side. The uppermost leaf sometimes has in its axil a thin membranaceous nerveless obtuse bract which clasps the spikelets like a second (upper) glume, but probably this is to be interpreted as a prophyllum, subtending a branch which failed to develop.

17. DISTICHLIS Raf.

Plants diœcious; spikelets several to many flowered, the rachilla of the pistillate spikelets disarticulating above the glumes and between the florets; glumes unequal, broad, acute, keeled, mostly

3-nerved, the lateral nerves sometimes faint or obscured by striations and intermediate nerves; lemmas closely imbricate, firm, the pistillate coriaceous, the margins bowed out near the base, acute or acutish, 3-nerved, with several intermediate nerves or striations; palea as long as the lemma or shorter, the pistillate coriaceous, inclosing the grain.

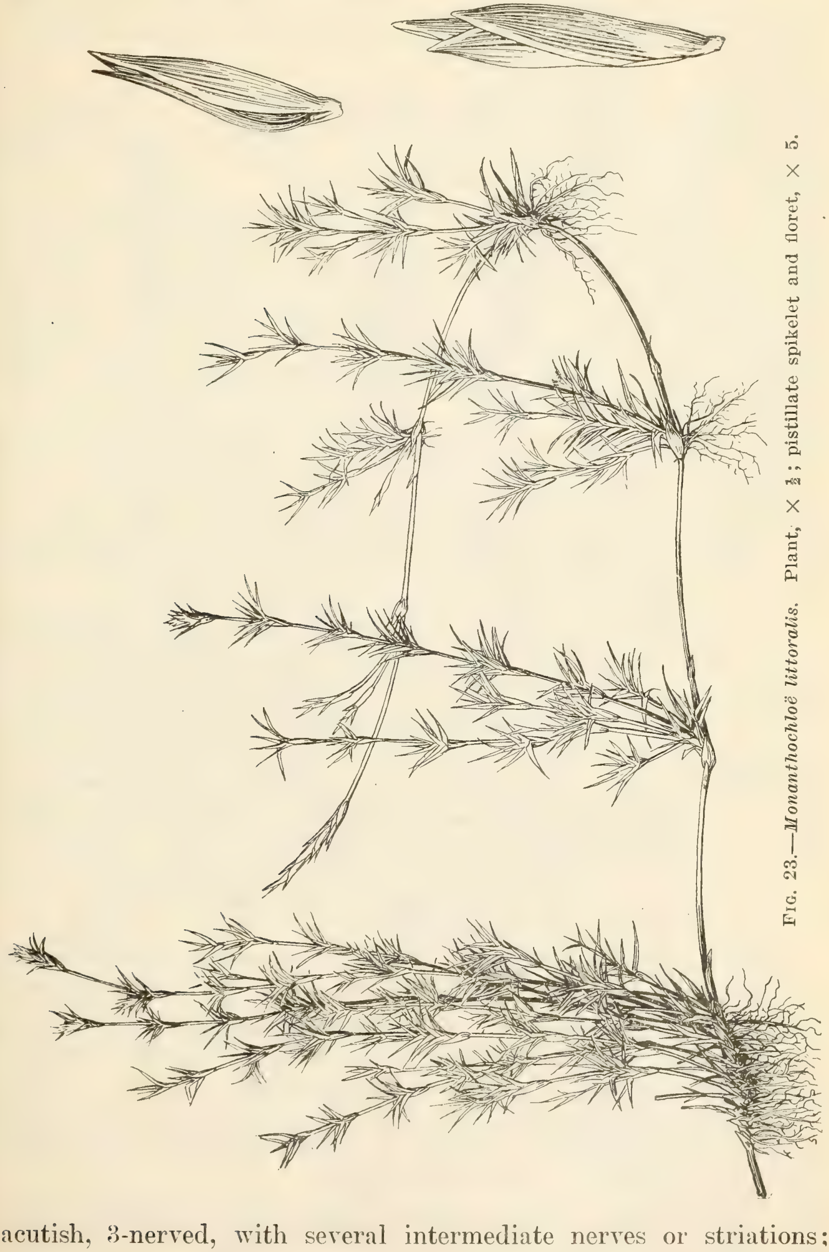


FIG. 23.—*Monanthochloë littoralis.* Plant, × ½; pistillate spikelet and floret, × 5.

Low perennials, with extensively creeping scaly rhizomes, erect, rather rigid stems, and short, dense, rather few-flowered panicles. Species about six, in salt marshes of the coast and interior in America, one extending to Australia; three species in the United States, one widely distributed and two confined to Texas and northern Mexico.

Type species: *Uniola spicata* L.

Distichlis Raf., Journ. de Phys. **89**: 104. 1819. *Distichlis maritima* is indicated as the type by Rafinesque, who gives *Uniola spicata* L. as a synonym.

Brizopyrum Presl, Rel. Haenk. **1**: 280. 1830. Presl describes five species, of which the first two belong to Distichlis. None is figured. The first species, ***B. boreale*** **(*Distichlis spicata*)**, is selected as the type.

The common species, *Distichlis spicata* (L.) Greene (fig. 24), is found along both coasts and in salt or alkali spots in the interior, and extends southward to South America and to Australia. It is an erect, gregarious grass usually not more than a foot high, with pale spikelets, the staminate having a softer texture than the pistillate. The common name is salt or alkali grass, though these names are sometimes applied to other species. In general it has little value for forage but in the interior basins, such as the vicinity of Salt Lake, it is utilized for grazing when better grasses are not available. The large amount of salt or alkali may cause digestive disturbances. This species is variable, and two forms have been distinguished as species, *D. stricta* (Torr.) Rydb. and *D. dentata* Rydb., both from the Western States.

The two species of the Southwest are not well known. *Distichlis texana* (Vasey) Scribn., a larger grass than *D. spicata*, with less compressed spikelets and a long, narrow, loose panicle, is found from Texas to Durango. *Distichlis multinervosa* (Vasey) Piper is an anomalous species from western Texas known only from the type collection. It differs in having a villous rachilla and 7-nerved membranaceous lemmas, rounded on the back and villous on the lower part, and in the 2-lobed palea.

18. Uniola L.

Spikelets 3 to many flowered, the lower one to four lemmas empty, the rachilla disarticulating above the glumes and between the florets; glumes compressed-keeled, rigid, usually narrow, nerved, acute or acuminate, or rarely mucronate; lemmas compressed, sometimes conspicuously flattened, chartaceous, many-nerved, the nerves sometimes obscure, acute or acuminate, the empty ones at the base usually successively smaller, the uppermost usually reduced; palea rigid, sometimes bowed out in the winged keels.

Perennial, rather tall, erect grasses, with flat or sometimes convolute blades and narrow or open panicles of compressed, sometimes very broad and flat spikelets. Species nine, all North American.

six being represented in the United States, these inhabiting the Southeastern States, some species extending as far north as Long Island and as far west as Kansas and Texas.

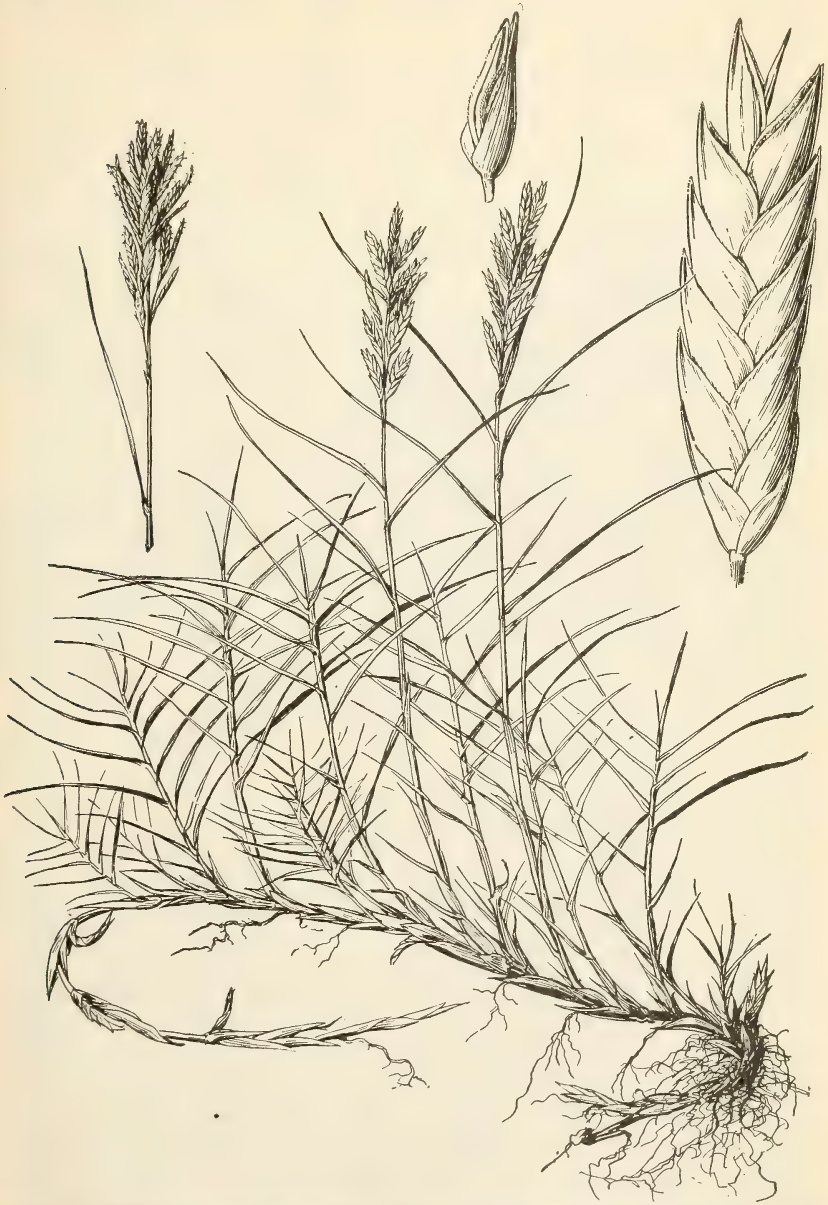


FIG. 24.—Salt-grass, *Distichlis spicata.* Staminate plant and a pistillate panicle, × ½; pistillate spikelet and floret, × 5.

Type species: *Uniola paniculata* L.

Uniola L., Sp. Pl. 71, 1753; Gen. Pl., ed. 5, 32. 1754. Linnæus describes two species, *U. paniculata* and *U. spicata.* The first species is selected as the type. The second is now referred to Distichlis.

Trisiola Raf., Fl. Ludov. 144. 1817. A single species, *T. paniculata*, based on *Uniola paniculata* L., is included.

Nevroctola Raf., Neogenyt. 4. 1825. "Type Uniola maritima or paniculata." *Uniola maritima* Michx. is *U. paniculata* L.

Chasmanthium Link, Hort. Berol. 1: 159. 1829. A single species, *C. gracile*, based on *Uniola gracilis* Michx., is included. This is the same as *U. laxa* (L.) B. S. P.

Uniola paniculata, seaside oats, common on the coastal sand dunes from Virginia to Texas, is a stout, pale grass, with extensively creeping rhizomes, long-attenuate, firm blades, and large, drooping, heavy, rather compact panicles of large, flat, stramineous spikelets. It is an excellent sand binder. *Uniola latifolia* Michx. (Pl. VI; fig. 25) is a woodland grass with broad flat blades and handsome, open, drooping, rather few-flowered panicles of large, very flat green spikelets. The species is worthy of use in landscape gardening. This and the remaining species of Uniola are of minor importance as forage grasses, as they are not sufficiently abundant. The seeds of *U. palmeri* Vasey are used for food by the Cocopa Indians.

19. ARUNDO L.

Spikelets several-flowered, the florets successively smaller, the summits of all about equal, the rachilla glabrous, disarticulating above the glumes and between the florets; glumes somewhat unequal, membranaceous, 3-nerved, narrow, tapering into a slender point, about as long as the spikelet; lemmas thin, 3-nerved, densely long-pilose, gradually narrowed at the summit, the nerves ending in slender teeth, the middle one longer, extending into a straight awn.

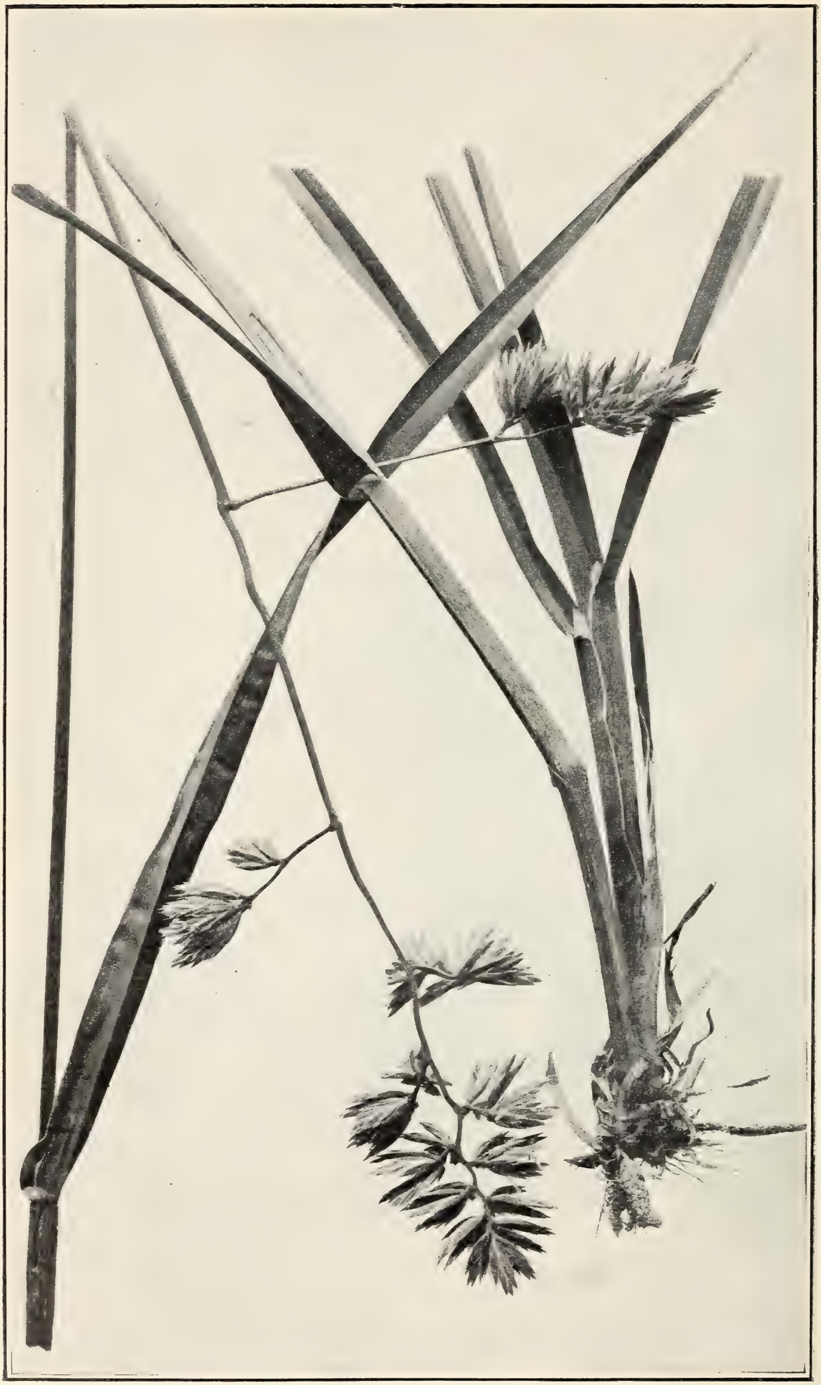
Tall perennial reeds, with broad linear blades and large plumelike terminal panicles. Species about six, in the warmer parts of the Old World; one introduced in America.

Type species: *Arundo donax* L.

Arundo L., Sp. Pl. 81, 1753; Gen. Pl., ed. 5, 35. 1754. Linnæus describes six *C*) represents the spikelets of *Arundo donax*, which is fully described on page Genera Plantarum is "Scheuch. 3: 14, 3." Scheuchzer's figure 14 (*A*, *B*, and *C*) represents the spikelets of *Arundo donax*, which is fully described on page 159 of Scheuchzer's work, Agrostographia. Hence, *Arundo donax*, the second species described by Linnæus, is the type species of the genus. The other original species are now referred as follows: *A. bambos* to Bambos, *A. phragmites* to Phragmites, *A. epigejos* and *A. calamagrostis* to Calamagrostis, *A. arenaria* to Ammophila.

Arundo donax, the giant reed (Pl. VII; fig. 26), is cultivated as an ornamental grass for lawn groups or borders. In tropical America it is frequently used for hedges, and the stems are utilized for a variety of purposes, such as the making of lattices in the construction of huts. The giant reed has become naturalized in the Southwestern States and sometimes forms a dense growth along irrigation ditches. There is a cultivated ornamental variety with white-striped blades (*A. donax versicolor* (Mill.) Kunth). This was mentioned in Miller's Gardener's Dictionary in 1768 as *Arundo versicolor*.

GIANT REED (ARUNDO DONAX). CULTIVATED FOR ORNAMENT.



ORCHARD GRASS (DACTYLIS GLOMERATA) IN FLOWER.

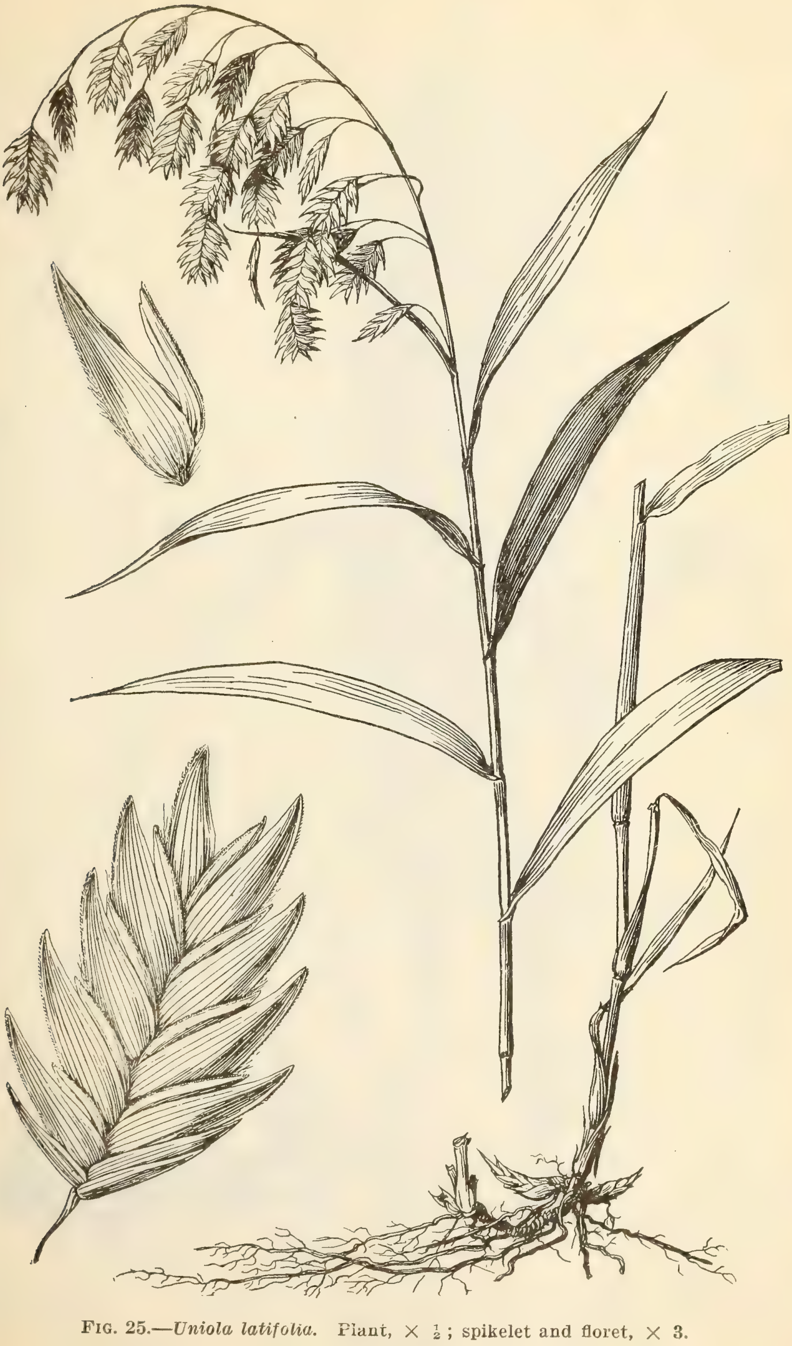


FIG. 25.—*Uniola latifolia.* Plant, × ½; spikelet and floret, × 3.

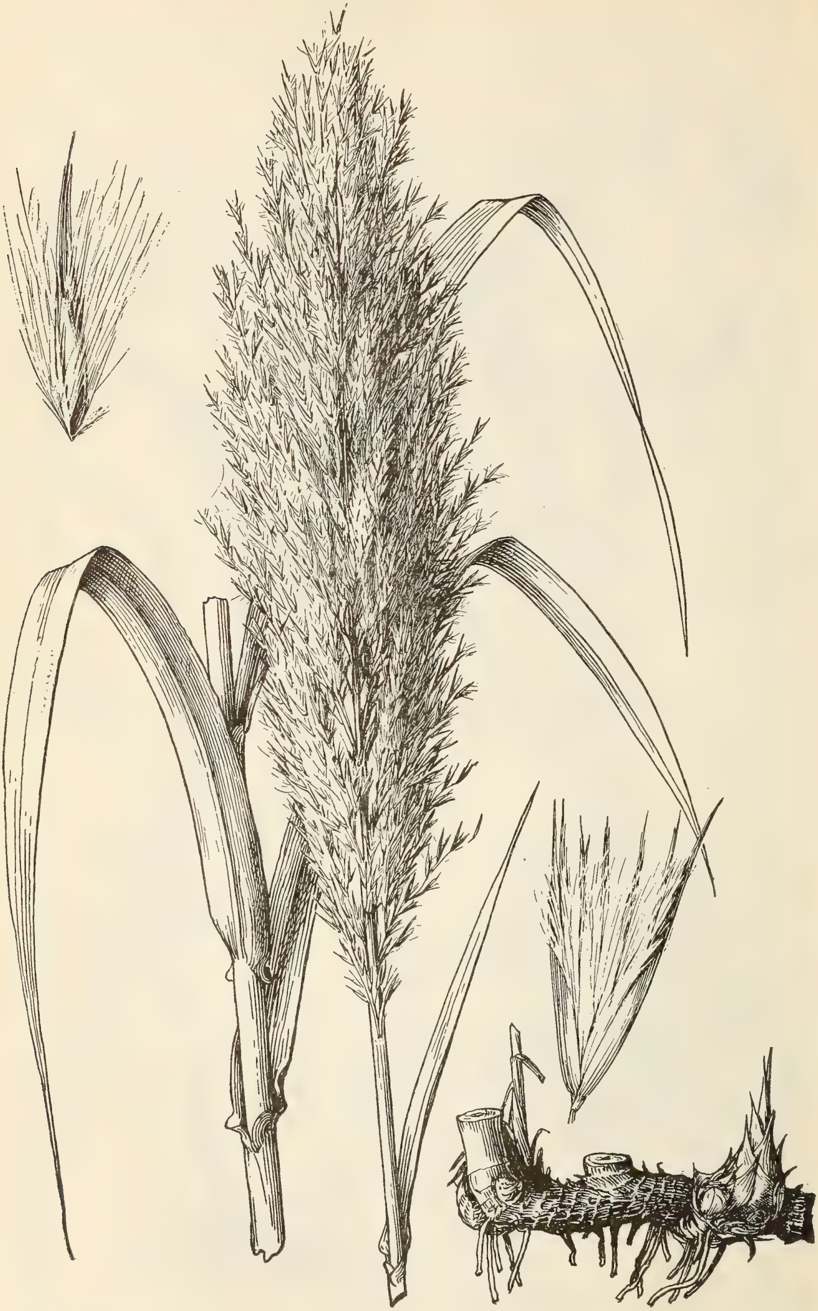


FIG. 26.—Giant reed, *Arundo donax.* Rhizome, leaves, and panicle, × $\frac{1}{3}$; spikelet and floret, × 3.

The giant reed is one of the largest of the herbaceous grasses, its stem being as much as 20 feet tall. Ordinarily it grows in cultivation to a height of 6 to 10 feet. The rhizome is thick and knotty. The blades are flat, 2 to 3 inches broad (smaller on the branches), and distributed rather equally along the culm, the distichous arrangement being conspicuous. The handsome feathery panicle is 1 to 2 feet long, the spikelets being about one-half inch long. In the Southwest this is sometimes called by the Mexican name carrizo. The stems of the giant reed are used for making clarionet and organ-pipe reeds.

Two large cultivated grasses or reeds allied to Arundo are Gynerium and Cortaderia.

Gynerium Humb. and Bonpl., Pl. Aequin. **2:** 105, pl. 115. 1809. The single species described and figured is *G. saccharoides* Humb. and Bonpl. This species, now called *G. sagittatum* (Aubl.) Beauv., is a giant diœcious grass as much as 30 or 40 feet tall, with culms clothed below with old sheaths from which the blades have fallen, sharply serrulate blades, commonly 6 feet long and about 2 inches wide (forming a great fan-shaped summit to the sterile culms), and pale, plumy, densely flowered panicles 3 or more feet long, the main axis erect, the branches drooping; spikelets several-flowered, the pistillate with long-attenuate glumes and smaller long-silky lemmas, the staminate with shorter glumes and glabrous lemmas. This grass, found along streams in tropical America, is cultivated occasionally in greenhouses under the name of uva grass.

Cortaderia Stapf, Gard. Chron. III. **22:** 396. 1897. Stapf includes five species in the genus, the first of which is *C. argentea.* The genus is technically designated on the page indicated in the citation, but on a preceding page (p. 378) he says, "Taking *Gynerium argenteum* as representative of the Cortaderas, . . .". Hence *Gynerium argenteum* is selected as the type. This species, called *C. argentea* (Nees) Stapf, is an erect diœcious perennial reed, growing in large bunches, with numerous long, narrow, basal blades, very rough on the margins, and stout flowering culms 6 to 10 feet high, with beautiful feathery, silvery white or pink panicles or plumes 1 to 3 feet long; spikelets 2 to 3 flowered, the pistillate silky with long hairs, the staminate naked; glumes white and papery, long and slender; lemmas bearing a long slender awn. This grass, called pampas grass, is a native of Argentina. It is cultivated as a lawn ornamental, being hardy in the warmer parts of the United States. Pampas grass is cultivated commercially in southern California for the plumes, which are used for decorative purposes. The plants grow here to enormous size, as much as 20 feet in height.

20. PHRAGMITES Adans., the reeds.

Spikelets several-flowered, the rachilla clothed with long silky hairs, disarticulating above the glumes and at the base of each joint between the florets, the lowest floret staminate or neuter; glumes 3-nerved, or the upper 5-nerved, lanceolate, acute, unequal, the first about half as long as the upper, the second shorter than the florets; lemmas narrow, long-acuminate, glabrous, 3-nerved, the florets successively smaller, the summits of all about equal; palea much shorter than the lemma.

Perennial reeds, with broad, flat linear blades and large terminal panicles. Species three, one in Asia, one in Argentina, and one cosmopolitan.

Type species: *Arundo phragmites* L.

Phragmites Adans., Fam. Pl. **2**: 34, 559. 1763. Adanson cites "Arundo Scheuz. 161," which Linnæus also cites under *Arundo phragmites*. Adanson cites besides four other pre-Linnæan references, two of them queried. The other two, which may refer to sugar cane or to sorghum, are to be excluded because the few generic characters given, especially that the spikelets have several perfect flowers, do not at all apply to them, but do apply to *Arundo phragmites*. Trinius[1] publishes Phragmites as a new genus based on *Arundo phragmites* L., changing the specific name to *P. communis*.

Trichoon Roth, Archiv Bot. Roemer 1^3: 37. 1798. Based on *Arundo karka* Retz., an East Indian species of Phragmites.

Miphragtes Nieuwl., Amer. Midl. Nat. **3**: 332. 1914. The name suggested for Phragmites Trin. not Phragmites Adans. in case Trichoon Roth and Oxyanthe Steud., to each of which Nieuwland transfers the specific name "Phragmites," should not "be applicable."

Our single species *Phragmites communis* Trin. (*P. phragmites* (L.) Karst.) (fig. 27) is a tall reed with creeping rhizomes, leaves about an inch broad, and panicles commonly a foot long. It grows in marshes, around springs, and along lakes and streams throughout the United States. Besides the rhizomes it produces extensively creeping leafy stolons. In the Southwest this species, in common with *Arundo donax*, is called by the Mexican name carrizo and is used for lattices in the construction of adobe huts. The stems were used by the Indians for the shafts of arrows, and in Mexico and Arizona for mats and screens.

21. DACTYLIS L.

Spikelets few-flowered, compressed, finally disarticulating between the florets, nearly sessile in dense one-sided fascicles, these borne at the ends of the few branches of a panicle; glumes unequal, carinate, acute, hispid-ciliate on the keel; lemmas compressed-keeled, mucronate, 5-nerved, ciliate on the keel.

Perennials, with flat blades and fascicled spikelets. Species two or three, in Eurasia; one, *Dactylis glomerata*, a native of Europe, cultivated and naturalized in the United States.

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[1] Fund. Agrost. 134. 1820.

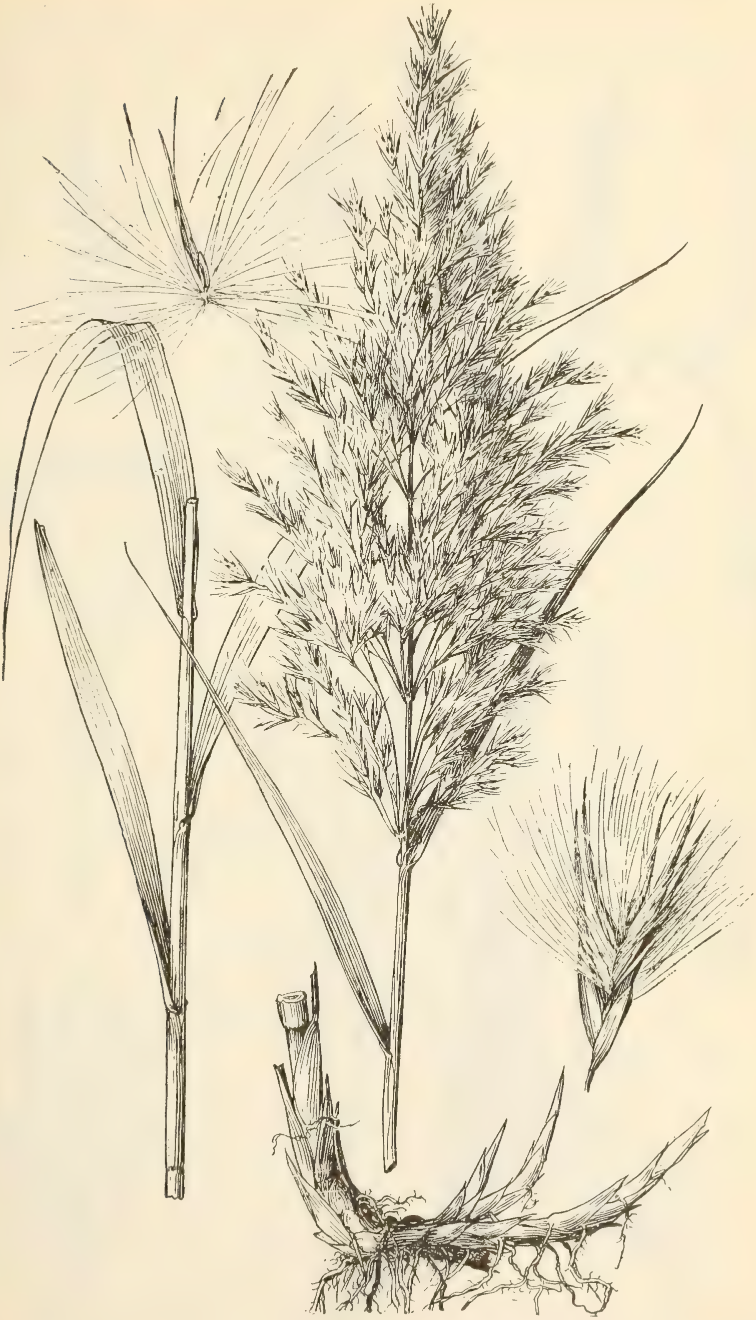

FIG. 27.—Reed, *Phragmites communis.* Rhizomes, leaves, and panicles, × $\frac{1}{3}$; spikelet and floret, × 3.

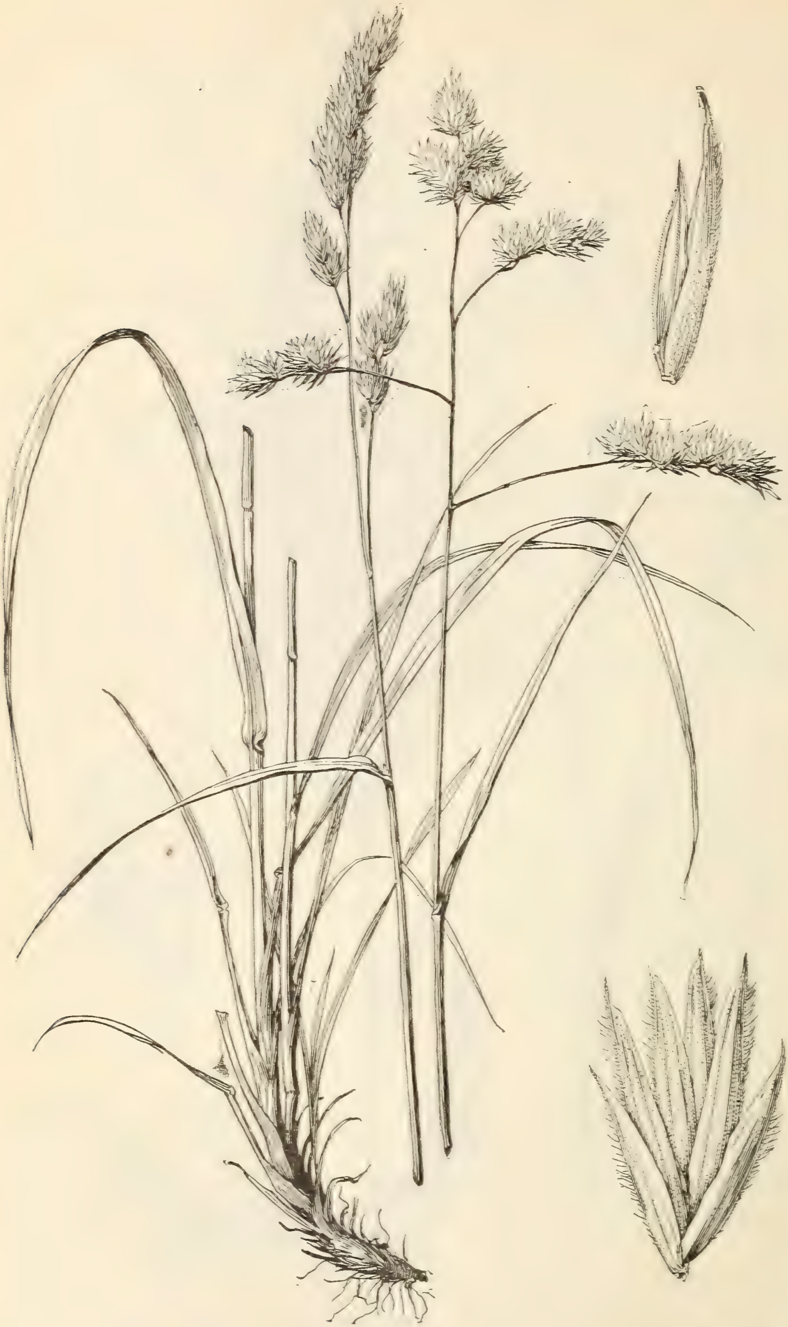

FIG. 28.—Orchard grass, *Dactylis glomerata*. Plant, × ½; spikelet and floret, × 5.

Type species: *Dactylis glomerata* L.

Dactylis L., Sp. Pl. 71, 1753; Gen. Pl., ed. 5, 32. 1754. Linnæus describes two species, *D. cynosuroides* from Virginia, and *D. glomerata* from Europe. The latter species being described in his flora of Sweden is chosen as the type.

Dactylis glomerata, orchard grass (Pl. VIII; fig. 28), is a well-known meadow and pasture grass, cultivated in the humid region of the United States. It is a rather coarse, erect, perennial bunch-grass, soon forming large tussocks, with culms 2 to 4 feet tall, flat blades as much as one-third of an inch wide, panicles 3 to 8 inches long, with a few stiff branches, spreading in flower, appressed in fruit. In England this is called cocksfoot grass. Orchard grass is recommended for shaded situations, as it withstands shade better than our other meadow grasses.

22. Cynosurus L.

Spikelets of two kinds, sterile and fertile together, the fertile sessile, nearly covered by the short-pediceled sterile one, these pairs imbricate in a dense one-sided spikelike panicle; sterile spikelets consisting of two glumes and several narrow, acuminate, 1-nerved lemmas on a continuous rachilla; fertile spikelets 2 or 3 flowered, the glumes narrow, the lemmas broader, rounded on the back, awn-tipped, the rachilla disarticulating above the glumes.

Species four, in the Mediterranean region; one occasionally cultivated in the United States and sparingly escaped into waste places.

Type species: *Cynosurus cristatus* L.

Cynosurus L., Sp. Pl. 72, 1753; Gen. Pl., ed. 5, 33. 1754. Linnæus describes nine species. The first species, *C. cristatus*, is chosen as the type because it is an economic species and is one of three species described in his flora of Sweden. Of the remaining Linnæan species, one, *C. echinatus*, is now retained in Cynosurus; *C. lima* is referred to Wangenheimia; *C. durus*, to Scleropoa; *C. coerulcus*, to Sesleria; *C. aegyptius*, to Dactyloctenium; *C. indicus*, to Eleusine; *C. paniceus*, to Polypogon; *C. aureus*, to Achyrodes.

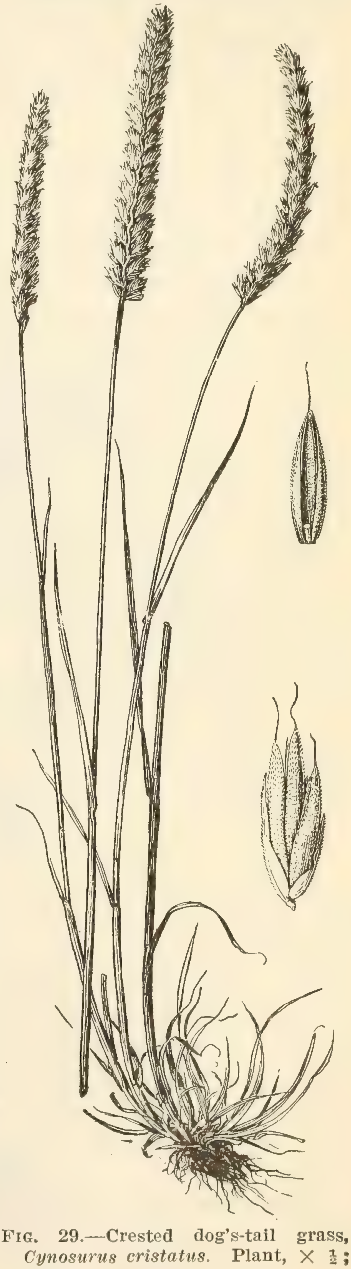

Fig. 29.—Crested dog's-tail grass, *Cynosurus cristatus*. Plant, × ½; fertile spikelet and floret, × 5.

The only species in the United States is *Cynosurus cristatus* L. (fig. 29), known as crested dog's-tail grass. This is occasionally sown in mixtures for meadows, but has nothing especially to recommend it. It is a tufted perennial 1 to 2 feet tall, the panicles 2 to 4 inches long.

23. ACHYRODES Boehmer.

(*Lamarckia* Moench.)

Spikelets of two kinds, in fascicles, the terminal one of each fascicle fertile, the others sterile; fertile spikelet, with 1 perfect floret, the rachilla produced beyond the floret, bearing a small awned empty lemma or reduced to an awn; glumes narrow, acuminate or short-awned, 1-nerved; lemma broader, raised on a slender stipe, scarcely nerved, bearing just below the apex a delicate straight awn; sterile spikelets linear, 1 to 3 in each fascicle, consisting of 2 glumes similar to those of the fertile spikelet, and numerous distichously imbricate, obtuse, awnless, empty lemmas.

A low, erect annual, with flat blades and oblong, one-sided, compact panicles, the crowded fascicles drooping, the fertile being hidden, except the awns, by the numerous sterile ones. Species one, a native of southern Europe, naturalized in southern California.

Type species: *Cynosurus aureus* L.

Achyrodes Boehmer, in Ludw. Def. Gen. Pl. 420. 1760. The genus is based on a phrase name of Tournefort, which Linnæus cites under *Cynosurus aureus* L.

Lamarckia Moench, Meth. Pl. 201. 1794. A single species is described, *L. aurea* (*Cynosurus aureus* L.).

Chrysurus Pers., Syn. Pl. 1: 80. 1805. A single species, *C. cynosuroides*, based on *Cynosurus aureus* L., is included.

The single species, *Achyrodes aureum* (L.) Kuntze (fig. 30), is abundantly naturalized in southern California. It is called goldentop because of its beautiful golden yellow panicles.

24. MELICA L.

Spikelets 2 to several flowered, the rachilla disarticulating above the glumes and between the florets, prolonged beyond the perfect florets and bearing at the apex two or three gradually smaller empty lemmas, convolute together or the upper inclosed in the lower; glumes somewhat unequal, thin, often papery, scarious-margined, obtuse or acute, sometimes nearly as long as the lower floret, 3 to 5 nerved, the nerves usually prominent; lemmas convex, several-nerved, membranaceous or rather firm, scarious-margined, sometimes conspicuously so, awnless or sometimes awned from between the teeth of the bifid apex.

Rather tall perennials, with the base of the culm often swollen into a corm, with closed sheaths, usually flat blades, narrow or sometimes open, usually simple panicles of relatively large spikelets. Species about 60, in the cooler parts of both hemispheres; 18 in the United States, mostly woodland grasses.

Type species: *Melica nutans* L.

Melica L., Sp. Pl. 66, 1753; Gen. Pl., ed. 5, 31. 1754. Linnæus describes three species, *M. ciliata*, *M. nutans*, and *M. altissima*, all species of Eurasia and all now retained in the genus Melica. In the Flora Lapponica, where the generic name was first used, the only species described is referred by Linnæus in the Species Plantarum to *M. nutans;* hence this species is selected as the type.

Bromelica Farwell, Rhodora **21:** 77. 1919. Based on Melica, section Bromelica Thurb., of which the type is *M. bromoides* Gray (*M. geyeri* Munro).

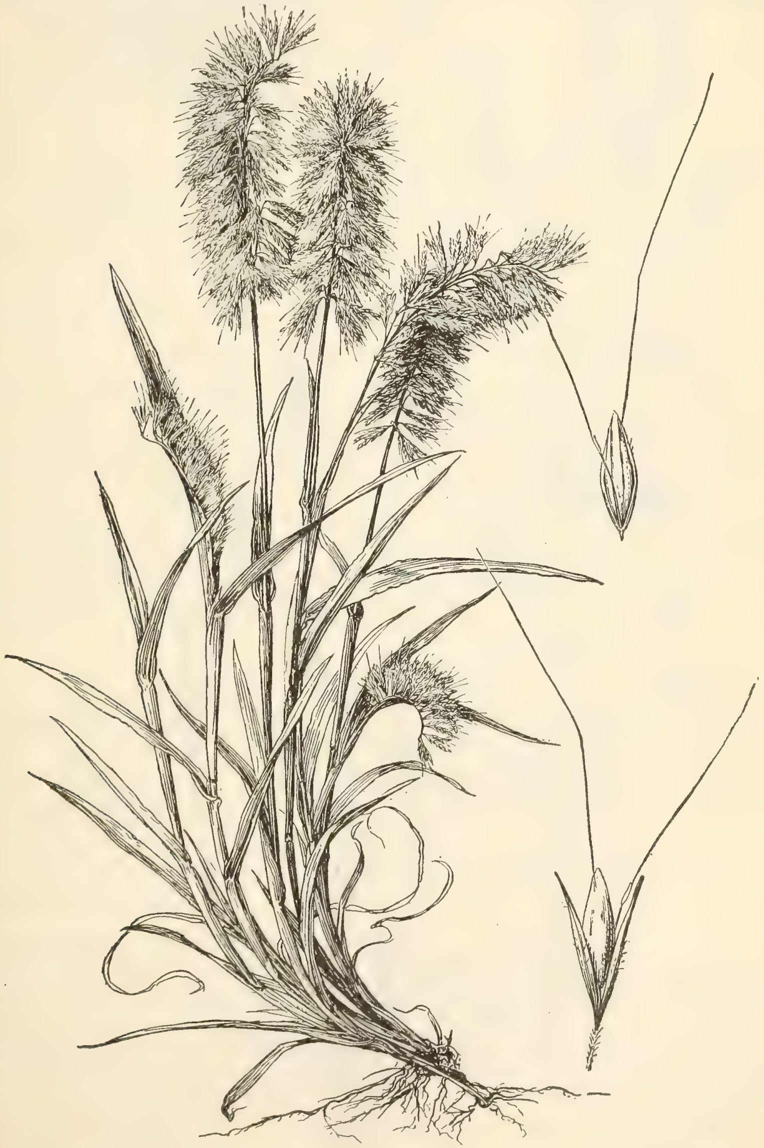

FIG. 30.—Golden-top, *Achyrodes aureum*. Plant, × ½; fertile spikelet and floret, × 5.

In our eastern species, *Melica mutica* Walt. (fig. 31) and *M. nitens* Nutt., the sterile lemmas form a rather prominent truncate or hood-

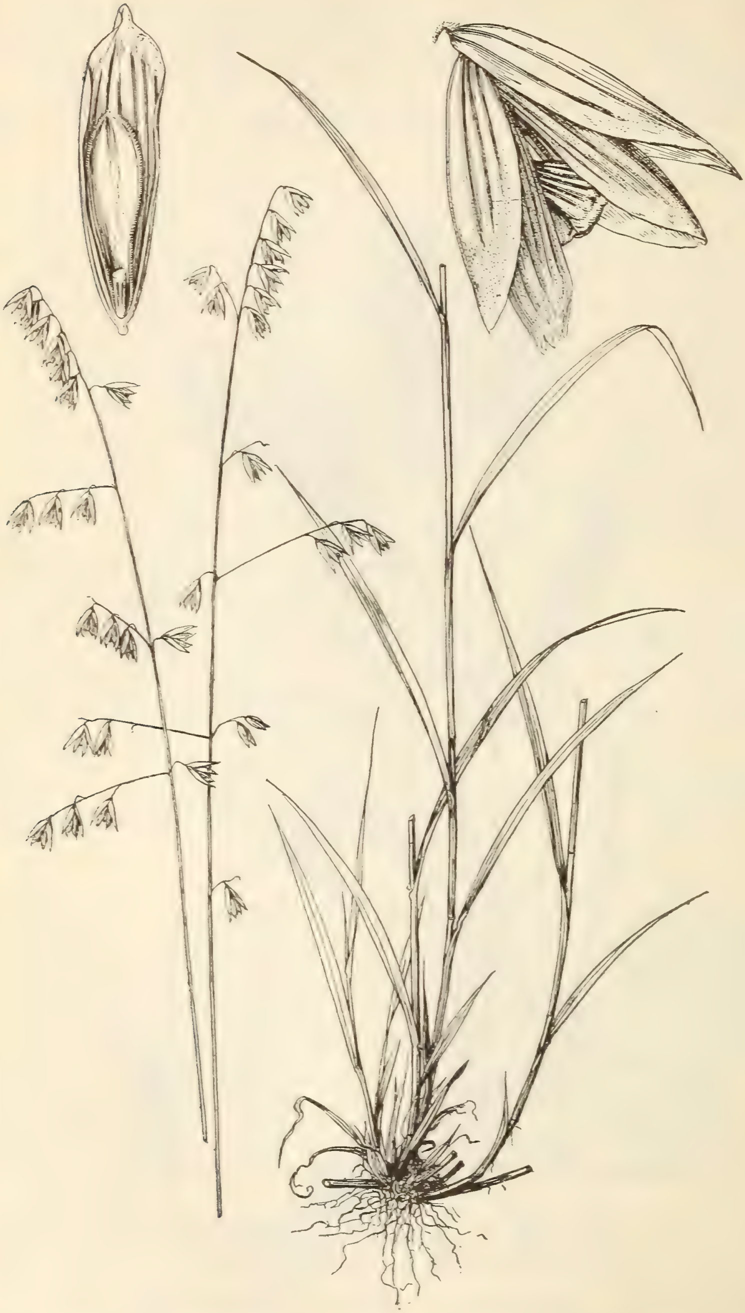

FIG. 31.—*Melica mutica.* Plant, × ½; spikelet and floret, × 5.

shaped body back of the upper floret, and the glumes and fertile lemmas are conspicuously scarious. In many of the western species the sterile lemmas are small and narrow, forming an inconspicuous body at the top of the rachilla, and the glumes and fertile lemmas are either broad or rather narrow with less conspicuous scarious margins. In *M. imperfecta* Trin., of California, there is but one fertile floret. One group of species with narrow, scarcely flattened spikelets and little-differentiated upper florets has been segregated as a section under the name Bromelica. The awned species of the genus, *M. aristata* Thurb. (fig. 32), *M. smithii* (Porter) Vasey, and *M. purpurascens* (Torr.) Hitchc., belong to this group. The inflorescence of Melica is usually narrow, a simple panicle or even a raceme, but in *M. smithii*, *M. geyeri* Munro, and *M. nitens* it may be an open but rather few-flowered panicle. The corms produced by many species are characteristic and have suggested the name onion grass often applied to them. The genus is distinguished from allied genera by the scarious margins of the glumes and lemmas. The awned species of the section Bromelica approach closely to Bromus.

The species of Melica, commonly called melic grasses, are in general excellent forage grasses. They are, however, not gregarious, and do not ordinarily furnish any large proportion of the forage of the ranges. The two most important species on the ranges are *M. bella* Piper and *M. spectabilis* Scribn. They have broad spikelets, bulbous bases, and narrow panicles, the first with erect pedicels, the second with slender recurved pedicels.

25. Anthochloa Nees.

Spikelets few-flowered, subsessile, on a simple axis and imbricate, the rachilla disarticulating above the glumes and between the florets; glumes (in our species) wanting; lemmas thin-membranaceous, flabelliform, whitish, petallike, many nerved; palea narrower than the lemma, hyaline.

Low annuals or perennials, with close spikes. Species three; two in the Andes, one in California.

Type species: *Anthochloa lepidula* Nees.

Anthochloa Nees; Meyen, Reise um Erde **2**: 14. 1835. One species mentioned. The description is meager and scarcely constitutes technical publication. It is as follows: "Wir sammelten hier ein sehr kleines aber äusserst schönes Gras, das die neue Gattung Anthochloa bildet und von Herrn Nees v. Esenbeck *Anthochloa lepidula* genannt worden ist (Anthochloa genus proximum Melicae, differt glumis brevioribus, valvula superiori quadrifida !)." The genus is first described by Endlicher[1] but no species is mentioned. Remy[2] describes the genus and one species (*A. rupestris*).

Stapfia Davy, Erythea **6**: 110, pl. 3, 1898, not Stapfia Chodat, 1897. One species described, *S. colusana*.

Neostapfia Davy, Erythea **7**: 43. 1899. A new name for Stapfia Davy.

Davyella Hack., Oesterr. Bot. Zeitschr. **49**: 133. 1899. A new name proposed for Stapfia Davy, not Chodat.

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[1] Gen. Pl. 99. 1836.

[2] Ann. Sci. Nat. Bot. III. **6**: 347. 1846.

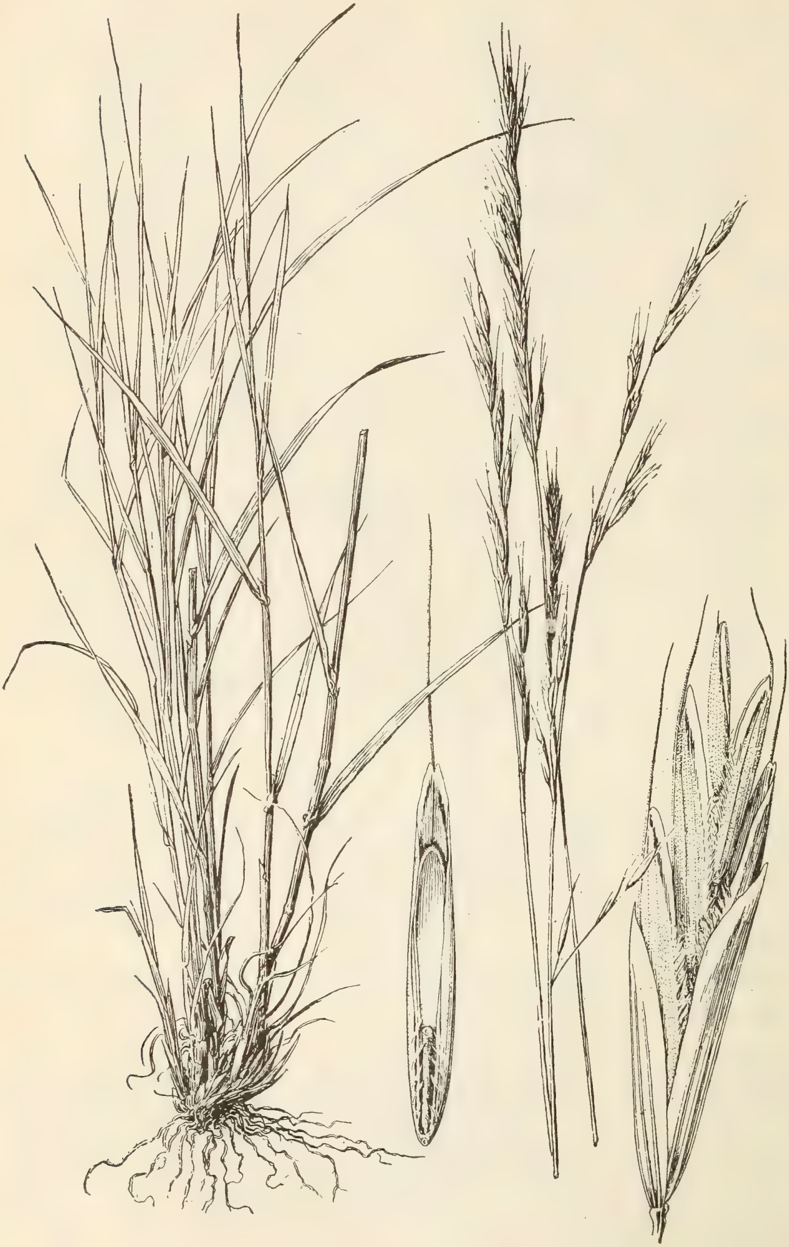

FIG. 32.—*Melica aristata.* Plant, × ½; spikelet and floret, × 5.

Our species, *Anthochloa colusana* (Davy) Scribn. (fig. 33), is known only from the type collection, from Colusa County, Calif. It is an annual, with broad flat leaves with no distinction between sheath and blade, and dense cylindric spikes, the upper part of the axis bearing, instead of spikelets, lanceolate-linear empty bracts.

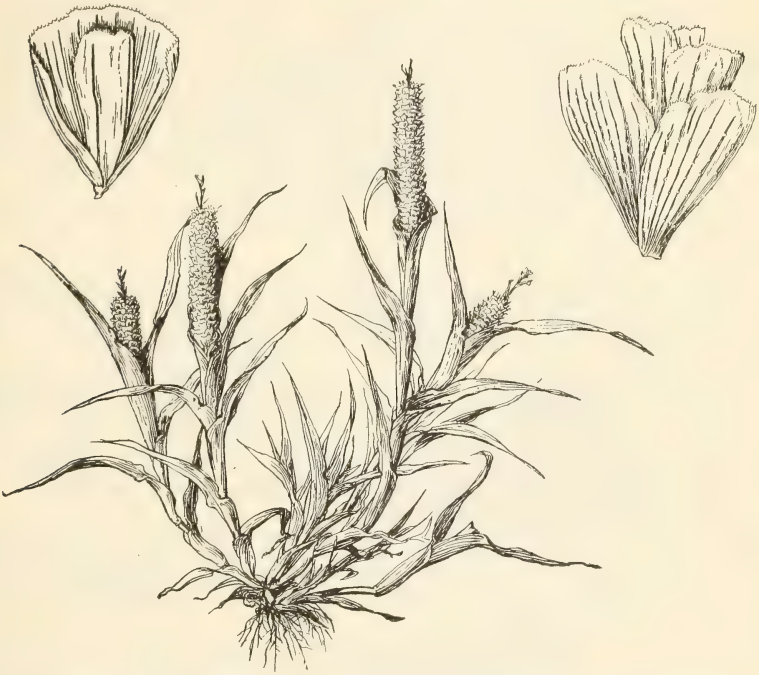

FIG. 33.—*Anthochloa colusana.* Plant × ½; spikelet and floret, × 5.

26. TRIODIA R. BR.

Spikelets several-flowered, the rachilla disarticulating above the glumes and between the florets; glumes membranaceous, often thin, nearly equal in length, the first sometimes narrower, 1-nerved or the second rarely 3 to 5 nerved, acute or acuminate; lemmas broad, rounded on the back, the apex from minutely emarginate or toothed to deeply and obtusely lobed, 3-nerved, the lateral nerves near the margins, the midnerve excurrent between the lobes as a minute point or as a short awn, the lateral nerves often excurrent as minute points, all the nerves pubescent below (subglabrous in one species), the lateral ones sometimes conspicuously so throughout; palea broad, the two nerves near the margin, sometimes villous.

Erect, tufted perennials, rarely rhizomatous or stoloniferous, the blades usually flat, the inflorescence an open or contracted panicle, or a cluster of few-flowered spikes interspersed with leaves. Species about 25, mostly in America; 15 species in the United States.

Type species: *Triodia pungens* R. Br.

Triodia R. Br., Prodr. Fl. Nov. Holl. **1**: 182. 1810. Six species are described, the first of which is selected as the type. In this the lemma is firm, rather obscurely 3-nerved, villous along the lower half of the back and margins, 2-toothed at the summit, the midnerve excurrent between the acute teeth as a short awn as long as the teeth, the lateral nerves extending into the teeth.

Tricuspis Beauv., Ess. Agrost. 77, pl. 15, f. 10, 1812, not Tricuspis Pers., 1807. The figured species is *T. caroliniana*, discussed in the following paragraph.

Tridens Roem. and Schult., Syst. Veg. **2**: 34. 1817. Under the description of the genus is a reference to a figure of Beauvois.[1] Beauvois describes the figure (which represents *Triodia flava*) under the name *Tricuspis caroliniana*. Under the description of the genus (p. 77) Beauvois mentions two species, *Poa caerulescens* Michx. and *Tricuspis novaeboracensis* Beauv. Both are nomina nuda, the first never having been published by Michaux, and Beauvois giving no description of the second. Roemer and Schultes on a later page (p. 599) describe the single species referred to Tridens, under the name *T. quinquefida*, based upon *Poa quinquefida* Pursh, which is *Triodia flava*.

Windsoria Nutt., Gen. Pl. **1**: 70. 1818. Two species are described, *W. poaeformis* Nutt., which is *Triodia flava*, and *W. ambigua* (Ell.) Nutt. The first is selected as the type.

Rhombolytrum Link, Hort. Berol. **2**: 296. 1833. The single species described is *R. rhomboidea* from Chile. Bentham and Hooker[2] state that two North American species, *Triodia albescens* and *T. trinerviglumis*, are allied to this. Nash[3] recognizes the genus Rhombolytrum and transfers to it *Sieglingia albescens* (Vasey) Kuntze.

Erioneuron Nash, in Small, Fl. Southeast. U. S. 143. 1903. The type, *Uralepis pilosa*, is indicated on page 1327 of the same work. Only one species included.

Dasyochloa Willd.; Rydb., Colo. Agr. Exp. Sta. Bull. **100**: 37. 1906. (Flora of Colorado.) The name first appeared in Steudel's Nomenclator[4] as a synonym of Uralepis (Uralepsis), where two species are listed, *D. avenacea* Willd. and *D. pulchella* Willd., both being herbarium names. The type and only species mentioned is *D. pulchella* (H. B. K.) Willd.

Some authors have referred our species to Sieglingia Bernh.[5] The type of Sieglingia is *Festuca decumbens* L. This species seems to represent a distinct genus, differing in having 5 to several nerved lemmas. The single species, *S. decumbens* (L.) Bernh., a native of Europe, is found in Newfoundland, but does not occur in the United States.

The species of Triodia are diverse in habit and in floral characters, but it does not seem practicable to segregate any of them as distinct genera. *Triodia flava* (the type of Tridens) and *T. pulchella* (the type of Dasyochloa) represent the two extremes, but they are connected by a series of intergrading species. The type species of Triodia, *T. pungens*, of Australia, in the form of its spikelets, stands about midway between our two extremes. Its spikelets, though less pubescent, are much like those of *T. avenacea*, with the midnerve of the lemma excurrent between the teeth, the lateral nerves not excurrent but extending into the teeth. *Triodia pulchella* H. B. K. (fig. 34) differs in habit from all the other species. It sends up from the basal cluster of leaves slender branches with elongate internodes, which produce at the extremity a cluster of short leaves and short, few-flowered spikes. Later from these clusters are produced slender branches, which in their turn form clusters of leaves and spikelets. The clusters bend to the ground and take root, so that ultimately there is formed a colony of these clusters of leaves and spikelets connected by the slender internodes. This species and two others, *T. avenacea* H. B. K. and *T. nealleyi* Vasey,

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[1] Beauv. Ess. Agrost. pl. 15, f. 10. 1812.

[2] Gen. Pl. 3: 1176. 1883.

[3] In Britton, Man. 129. 1901.

[4] Nom. Bot., ed. 2, 1: 484. 1840.

[5] Syst. Verz. Pflanz. Erfurt. 40. 1800.

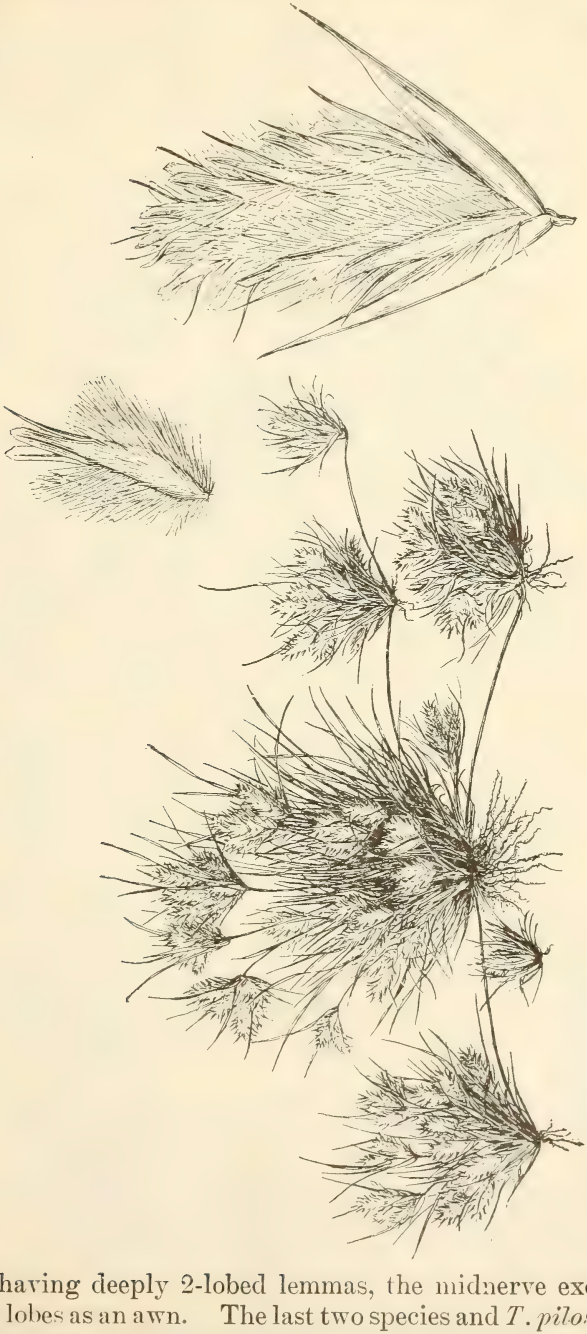

FIG. 34.—*Triodia pulchella.* Plant, × ½; spikelet and floret, × 5.

agree in having deeply 2-lobed lemmas, the midnerve excurrent between the lobes as an awn. The last two species and *T. pilosa* (Buckl.) Merr. have short, spikelike panicles, but the last species differs in having acuminate lemmas. These four species and *T. mutica* (Torr.) Scribn. agree in having woolly lemmas, the lower part of the three nerves being long-villous, and in having paleas villous on the wings. *Triodia mutica* has a somewhat elongate panicle and differs in having very obtuse, broad, sometimes minutely notched, awnless lemmas, the lateral nerves disappearing before reaching the margin. The aforementioned species might be set off under Erioneuron, but they would not form a coherent group.

Triodia flava (L.) Hitchc. (*Poa flava* L.) (fig. 35) has an open, elegantly drooping panicle of purple spikelets, the nerves of the lemmas pubescent below, extending into 3 mucros. This is common in autumn through the Eastern States in meadows and open woodland and is sometimes called purple-top. It exudes a sticky substance on the culm below the panicle and on the main branches of the inflorescence, to which dirt adheres. One species, *T. drummondii* Scribn. and Kearney, produces rhizomes.

Three species (besides *T. mutica* mentioned above) have a spikelike panicle. These are *T. albescens* Vasey, with glabrous lemmas; *T. elongata* (Buckl.) Scribn., with glumes nearly as long as the spikelet; and *T. stricta* (Nutt.) Vasey, with shorter glumes but mucronate lemmas. The other species have more or less open panicles.

In general the species of Triodia are of little importance agriculturally. *Triodia pulchella* is often abundant on the ranges, but is not relished by stock, the little dry plants being seldom eaten.

27. TRIPLASIS Beauv.

Spikelets few-flowered, the florets remote, the rachilla slender, terete, disarticulating above the glumes and between the florets; glumes nearly equal, smooth, 1-nerved, acute; lemmas narrow, 3-nerved, 2-lobed, the nerves parallel, pubescent or villous, the lateral pair near the margin, the midnerve excurrent as an awn, as long as or longer than the lobes; palea shorter than the lemma, 2-keeled, the keels densely long-ciliate on the upper half.

Slender tufted annuals or perennials, with short blades, short, open, few-flowered purple panicles terminating the culms, and cleistogamous narrow panicles in the axils of the leaves. Species three; southeastern United States.

Type species: *Triplasis americana* Beauv.

Triplasis Beauv., Ess. Agrost. 81, pl. 16, f. 10. 1812. The single species, *T. americana,* is figured.

Uralepis Nutt., Gen. Pl. 62. 1818. Nuttall describes two species, *U. purpurea,* based on *Aira purpurea* Walt. (*Triplasis purpurea* (Walt.) Chapm.) and *U. aristulata,* which is the same species. The first is selected as the type. The name is spelled Uralepsis, but this is a typographical error. Nuttall states that it is based on the Greek words oura and lepis.

Diplocea Raf., Amer. Journ. Sci. 1: 252. 1819. One species described, *D. barbata,* which is the same as *Triplasis purpurea.*

Merisachne Steud., Syn. Pl. Glum. 1: 117. 1854. Contains one species, *M. drummondii* Steud., *Drummond* 330, from Texas (*Triplasis purpurea*).

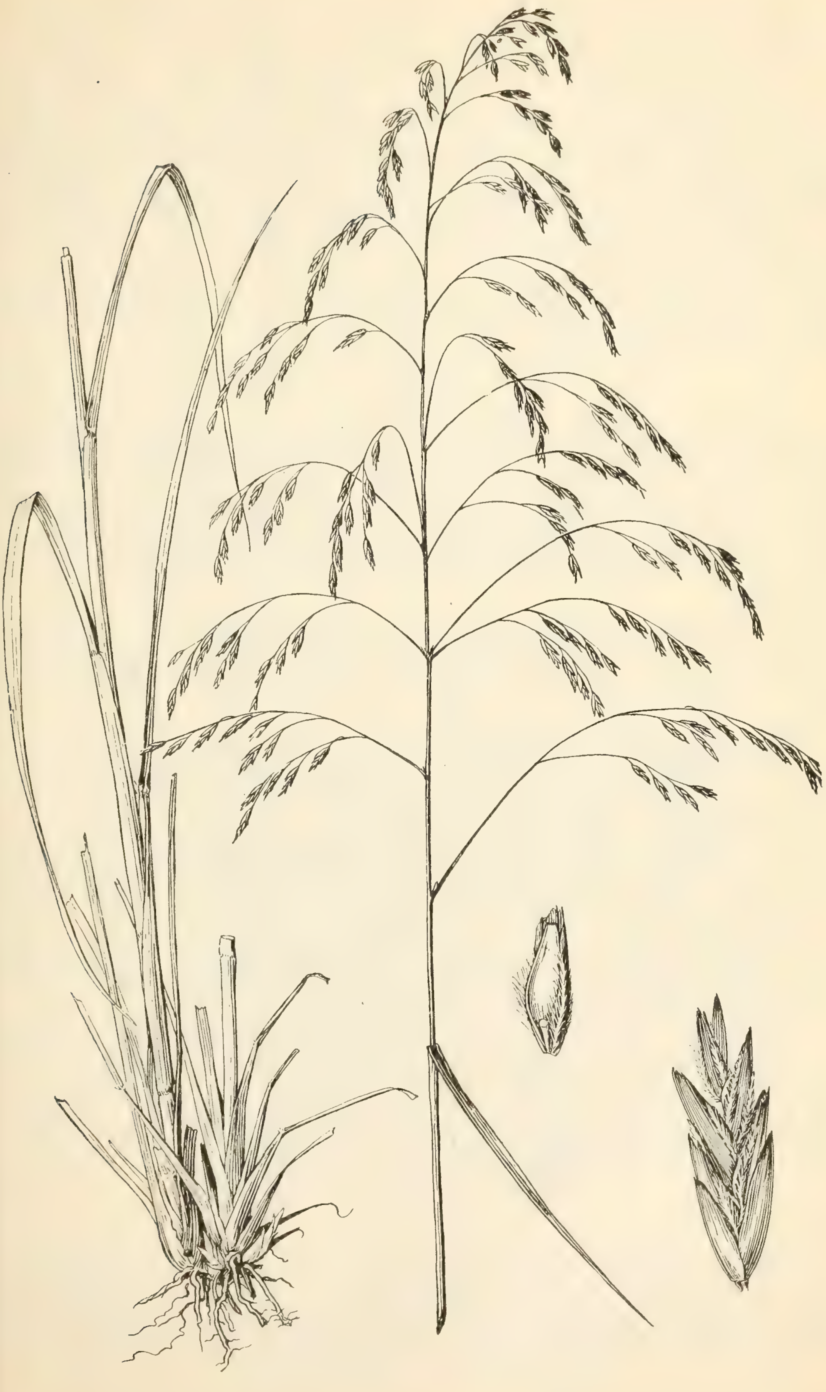

FIG. 35.—Purple-top, *Triodia flava*. Plant, × ½; spikelet and floret, × 5.

The three species are found in sandy soil in the Eastern States, *Triplasis purpurea* (fig. 36) from Maine to Florida and from the Great Lakes to Texas. *Triplasis intermedia* is confined to Florida; *T. americana* is found from North Carolina to Florida. All the species, besides the small panicles of cleistogamous spikelets in the upper sheaths, have additional cleistogamous spikelets, reduced to a single large floret, at the bases of the lower sheaths. The culms break at the nodes bearing these cleistogenes, the ripe seed remaining attached to the internode. The species are of no importance except as they tend to hold sandy soil.

For a revision of the species of Triplasis, see Nash, Bull. Torrey Club **25**: 561–565. 1898.

28. BLEPHARIDACHNE Hack.

Spikelets 4-flowered, the rachilla disarticulating above the glumes but not between the florets; glumes nearly equal, about as long as the spikelet, compressed, 1-nerved, thin, acuminate, smooth; lemmas deeply 3-lobed, 3-nerved, the first and second sterile, containing a palea but no flower, the third fertile, the fourth reduced to a 3-awned rudiment.

Low annuals or perennials, with short, congested, few-flowered panicles scarcely exserted from the subtending leaves. Species two; one in Argentina, one in Nevada.

Type species: *Eremochloë kingii* S. Wats.

Eremochloë S. Wats., in King, Geol. Expl. 40th Par. 382, pl. 40, 1871, not Eremochloa Büse, 1854. Two species are described, one *E. kingii* from Nevada and the other, in a footnote, *E. bigelovii*, from southern New Mexico. The two specimens are to be referred to the same species.

Blepharidachne Hack., in Engl. and Prantl, Pflanzenfam. 2^2: 126. 1887. In a footnote the name Blepharidachne is substituted for Eremochloë S. Wats., because of the earlier Eremochloa Büse. The author of Blepharidachne is given as "Hook.," a typographical error for Hack.

Blepharidachne kingii (S. Wats.) Hack. (fig. 37), found on the plains and foothills of Nevada (and New Mexico according to Watson), has been collected only a few times.

A second species, *Blepharidachne benthamiana* (Hack.) Hitchc. (*Munroa benthamiana* Hack.[1]) grows in dry regions of Argentina. In habit it resembles our *Munroa squarrosa*, but in floral structure it agrees with Blepharidachne, having two sterile florets, one fertile floret, and a 3-awned rudiment.

29. ORCUTTIA Vasey.

Spikelets several-flowered, the upper florets reduced; rachilla persistent, continuous, the florets falling away or tardily disarticulating; glumes nearly equal, shorter than the lemmas, broad, irregularly 2 to 5

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[1] In Kuntze, Rev. Gen. Pl. 3^2: 357. 1898.

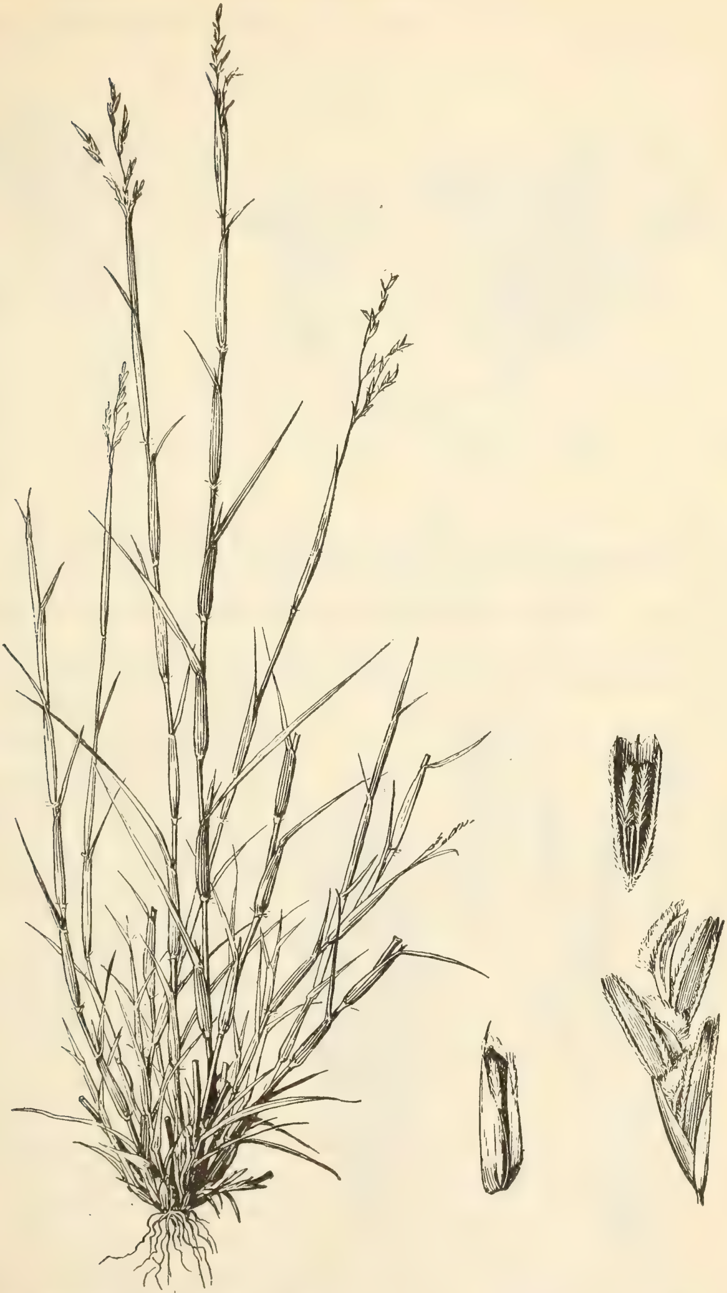

Fig. 36.—*Triplasis purpurea.* Plant, × ½; spikelet, floret (above) showing beard on the nerves of the palea and cleistogene (at left), a cleistogamous fertile 1-flowered spikelet from the axil of a lower leaf, all × 5.

toothed, many-nerved, the nerves extending into the teeth; lemmas firm, prominently 13 to 15 nerved, the broad summit with 5 long teeth or with numerous short teeth; palea broad, 2-nerved, as long as the lemma.

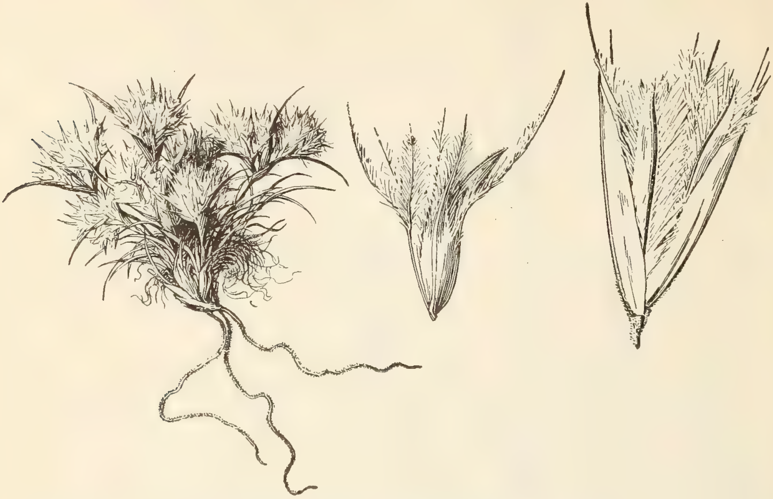

FIG. 37.—*Blepharidachne kingii.* Plant, × 1; spikelet and perfect floret, the latter showing the rudiment behind the palea, × 5.

Low cespitose annuals, with short blades and terminal spikelike racemes, the spikelets relatively large, appressed, the upper aggregate, the lower more or less remote. Species two; California and Lower California.

Type species: *Orcuttia californica* Vasey.

Orcuttia Vasey, Bull. Torrey Club **13**: 219, pl. 16. 1886. The one species described was collected by C. R. Orcutt at San Quentin Bay, Lower California.

Our species, both in California, are *Orcuttia greenei* Vasey, from Chico, of which only the type collection is known, and *O. californica* (fig. 38), which has been collected at Goose Valley. The latter species is distinguished by having 5-toothed lemmas; *O. greenei* has truncate lemmas, the nerves extending into short points.

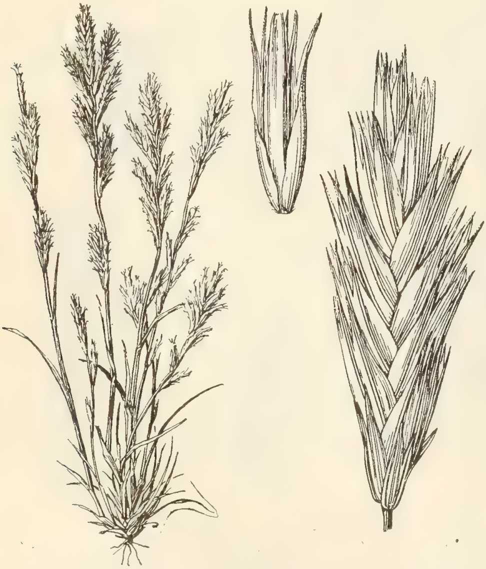

FIG. 38.—*Orcuttia californica.* Plant, × $\frac{1}{2}$; spikelet and floret, the latter without a joint of the rachilla, this not disarticulating, × 5.

30. SCLEROPOGON Philippi.

Plants diœcious. Staminate spikelets several-flowered, pale, the rachilla not disarticulating; glumes about equal, a perceptible internode between, membranaceous, long-acuminate, 1-nerved or obscurely 3-nerved, nearly as long as the first lemma; lemmas similar to the glumes, somewhat distant on the rachilla, 3-nerved or obscurely 5-nerved, the apex mucronate; palea obtuse, shorter than the lemma. Pistillate spikelets several-flowered, the upper florets reduced to awns, the rachilla disarticulating above the glumes but not separating between the florets or only tardily so; glumes acuminate, 3-nerved, with a few fine additional nerves, the first about half as long as the second; lemmas narrow, 3-nerved, the nerves extending into 3 slender, scabrous, spreading awns, the florets falling together forming a cylindric many-awned fruit, the lowest floret with a sharp-bearded callus as in Aristida; palea narrow, the two nerves near the margin, produced into short awns.

A perennial stoloniferous grass, with short flexuous blades and narrow few-flowered racemes or simple panicles, the staminate and pistillate strikingly different in appearance. Species one; Chile to southwestern United States.

Type species: *Scleropogon brevifolius* Philippi.

Scleropogon Philippi, Anal. Univ. Chile **36**: 205. 1870. Only one species described.

Lesourdia Fourn., Bull. Soc. Bot. France **27**: 102, pl. 3, 4. 1880. Two species are proposed, *L. multiflora* and *L. karwinskyana*, both referable to the same species, *Scleropogon brevifolius.*

This species (fig. 39) is found on semiarid plains and open valley lands from southern Colorado to Texas and Arizona and southward. The mature pistillate spikelets break away and with their numerous long spreading awns form "tumbleweeds" that are blown before the wind. The pointed barbed callus readily penetrates clothing or wool, the combined florets acting like the single floret of the long-awned aristidas. As a forage grass, this is inferior to grama; but on overstocked ranges, where it tends to become established, it is useful in preventing erosion. It is called burro grass.

31. COTTEA Kunth.

Spikelets several-flowered, the uppermost reduced, the rachilla disarticulating above the glumes and between the florets; glumes two, about equal, nearly equaling the lower lemma, with several parallel nerves; lemmas rounded on the back, villous below, prominently 9 to 11 nerved, the nerves extending partly into awns of irregular size and partly into awned teeth; palea awnless, a little longer than the body of the lemma.

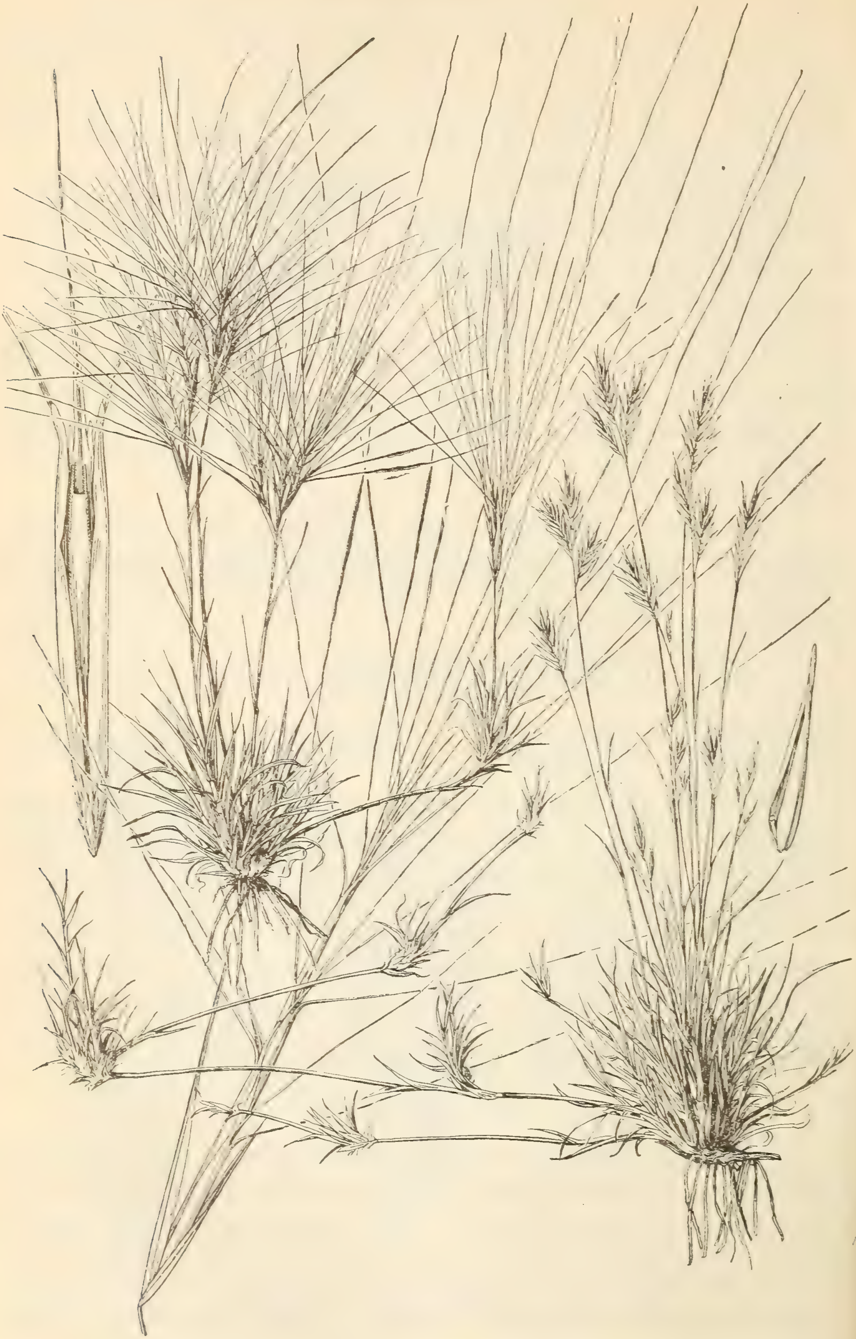

FIG. 39.—Burro grass, *Scleropogon brevifolius*. Pistillate (left) and staminate plants, × ½; pistillate spikelet, × 2; pistillate and staminate floret, × 5.

An erect tufted branching perennial, with oblong open panicles. Species one; western Texas to southern Arizona and southward to Argentina.

Type species: *Cottea pappophoroides* Kunth.

Cottea Kunth, Rev. Gram. 1: 84. 1829. A single species mentioned, from Peru.

This genus is allied to Pappophorum and very closely related to Anthoschmidtia of Africa. It differs from the first in the several-flowered spikelets that separate between the florets and in the awns interspersed with awned teeth. Anthoschmidtia differs in having glumes longer than the florets and in having lemmas with five awns alternating with four lobes.

Cottea pappophoroides Kunth (fig. 40) is not abundant enough to have agricultural importance in the United States. Cleistogenes are produced in the lower sheaths.[1]

32. PAPPOPHORUM Schreb.

Spikelets 2 to 5 flowered, the upper reduced, the rachilla disarticulating above the glumes but not between the florets, the internodes very short; glumes nearly equal, keeled, thin-membranaceous, as long as or longer than the body of the florets, 1 to several nerved, acute; lemmas rounded on the back, firm, obscurely many nerved, dissected above into numerous spreading scabrous or plumose awns, the florets falling together, the awns of all forming a pappuslike crown; palea as long as the body of the lemma, 2-nerved, the nerves near the margin.

Erect, cespitose perennials, with narrow or spikelike tawny or purplish panicles. Species 20, in the dry parts of the Old World, in Australia, and from Texas to Argentina; 3 species in the United States, from Texas to Arizona.

Type species: *Pappophorum alopecuroideum* Vahl.

Pappophorum Schreb.; Vahl, Symb. Bot. 3: 10. 1794. Only one species described.

Enneapogon Desv.; Beauv., Ess. Agrost. 81, pl. 16, f. 11. 1812. Beauvois mentions *Enneapogon desvauxii*, *Pappophorum gracile*, *P. nigricans*, *P. pallidum*, and *P. purpurascens*. The first one, being figured, is selected as the type.

Polyrhaphis (Trin.) Lindl., Veg. Kingd. 115. 1847. Based on Pappophorum, section Polyrhaphis Trin., under which a single species, *P. alopecuroides* Vahl, is included.

Pappophorum bicolor Fourn., with purplish, rather loose panicles, is found in southern and western Texas; *P. vaginatum* Buckl. (fig. 41), with pale, slender, spikelike panicles, and *P. wrightii* S. Wats. (fig. 42), with plumbeous short spikelike panicles and 9-nerved lemma, the nerves extending into 9 equal plumose awns, are found from western Texas to southern Arizona. *Pappophorum wrightii* produces cleistogamous spikelets in the lower sheaths. The cleistogenes are larger than the normal florets, but the awns are almost wanting. As is the

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[1] Chase, Amer. Journ. Bot. 5: 256. 1918.

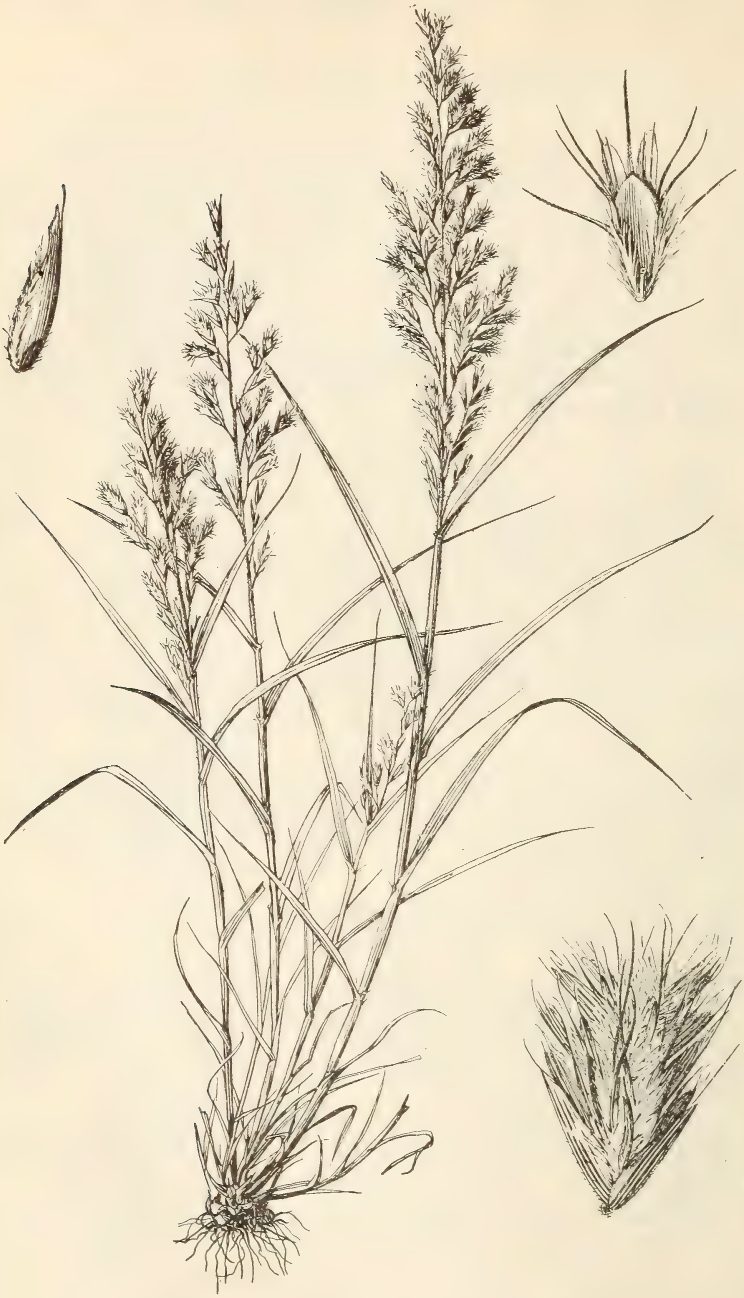


FIG. 40.—*Cottea pappophoroides.* Plant, × ½; spikelet, floret, and cleistogene (left) from axil of lower leaf, all × 5.

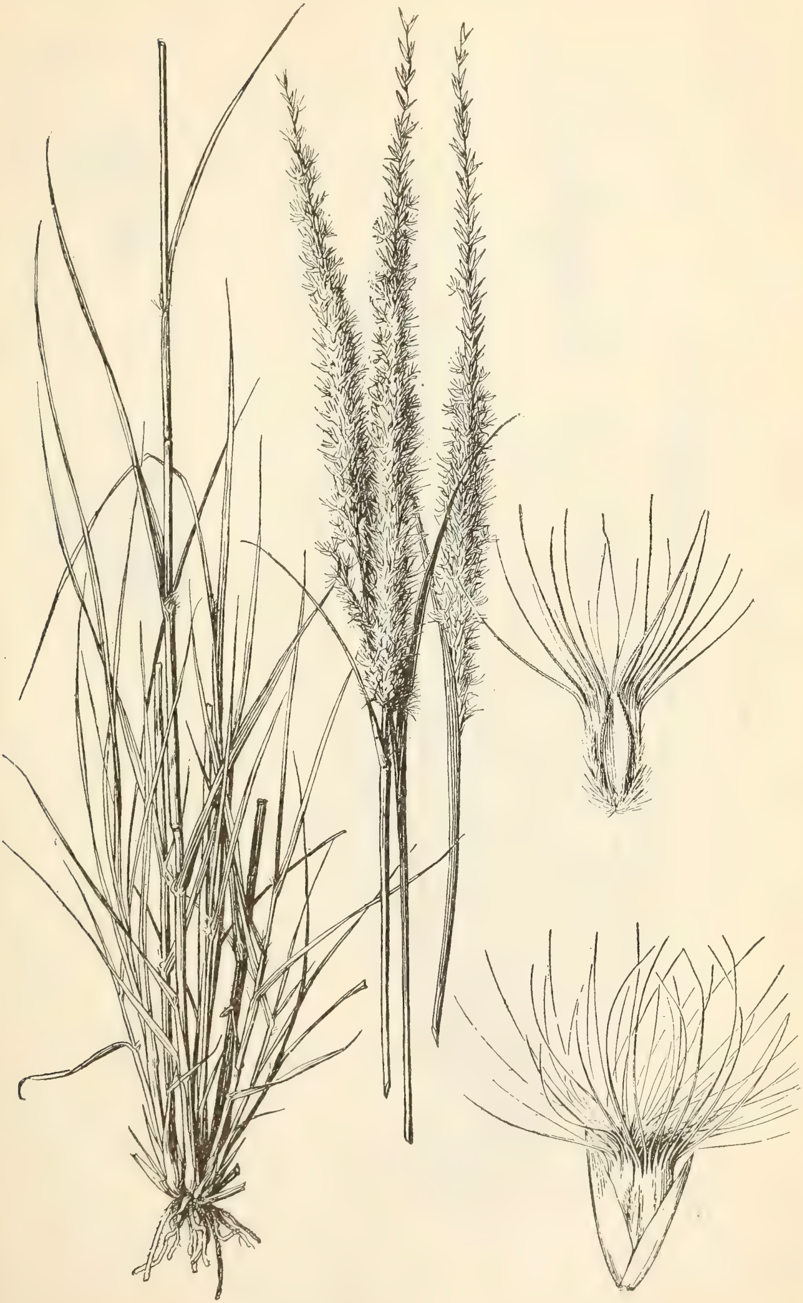


FIG. 41.—*Pappophorum vaginatum.* Plant, × ½; spikelet and perfect floret, × 5.

case with other grasses producing cleistogenes in the lower sheaths, the culms disarticulate at the lower nodes. Our species are of minor agricultural importance, the second and third sometimes constituting a fair proportion of the forage on sterile hills.

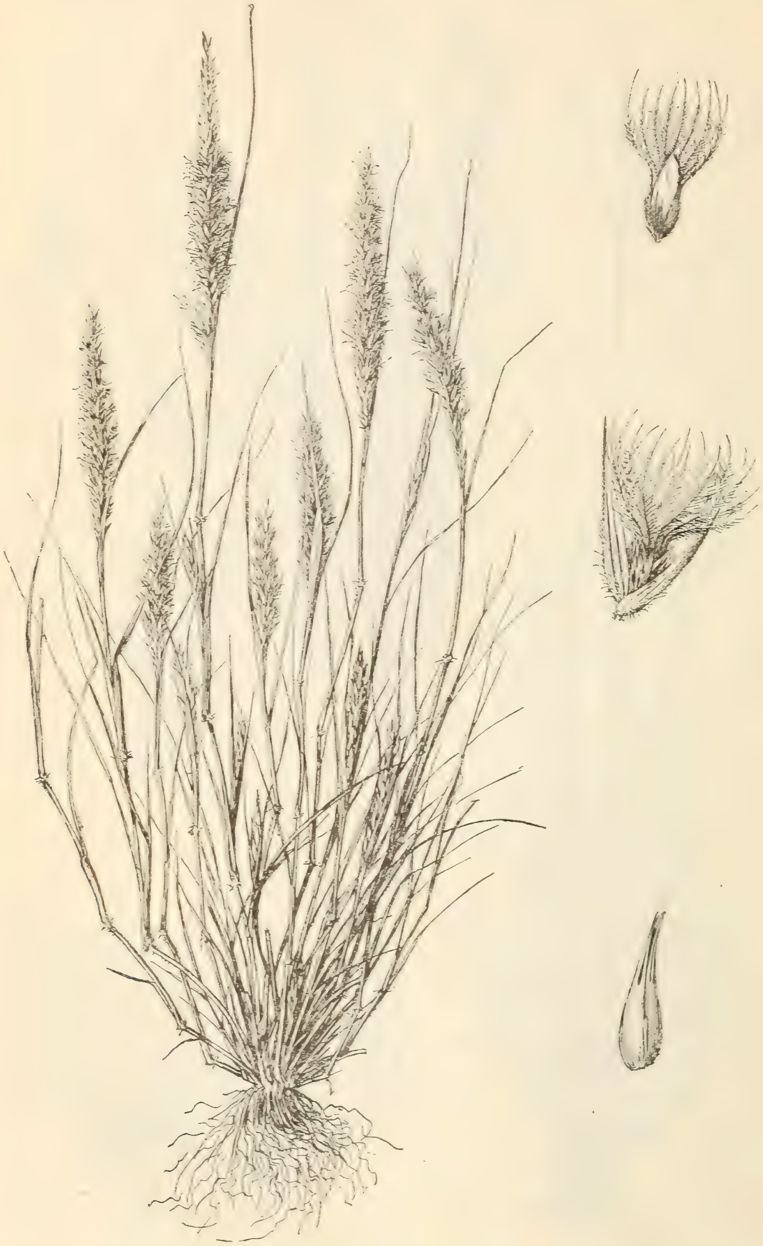


FIG. 42.—*Pappophorum wrightii.* Plant, × ½; spikelet, perfect floret, and cleistogene (below) from axil of lower leaf, all × 5.

3. HORDEAE, BARLEY TRIBE.

33. AGROPYRON Gaertn.

Spikelets several-flowered, solitary (or rarely in pairs), sessile, placed flatwise at each joint of a continuous (rarely disarticulating) rachis, the rachilla disarticulating above the glumes and between the florets; glumes two, equal, firm, several nerved, usually shorter than the first lemma, acute or awned, rarely obtuse or notched; lemmas convex on the back, rather firm, 5 to 7 nerved, usually acute or awned from the apex; palea shorter than the lemma.

Perennials or sometimes annuals, often with creeping rhizomes, with usually erect culms and green or purplish, usually erect spikes. Species about 60, in the temperate regions of both hemispheres; about 25 species in the United States.

Type species: *Agropyron triticeum* Gaertn.

Agropyron Gaertn., Nov. Comm. Acad. Sci. Petrop. **14:** 539, pl. 19, f. 4. 1770. Gaertner describes two species, *A. cristatum,* based on *Bromus cristatus* L., and a new species, *A. triticeum.* The second species is figured. The species are referred by some authors to Triticum. Some adopt the spelling Agropyrum.

The two original species of Agropyron are annuals, but all the North American species are perennials. Nine of our species produce creeping rhizomes. One of these is the well-known quack-grass or couch-grass (*A. repens* (L.) Beauv.) (Pl. IX; fig. 43), introduced from Europe. On account of its rhizomes, it is a troublesome weed in fields and meadows. Quack-grass can be distinguished by the glabrous, awnless or short-awned lemmas, awn-pointed glumes, thin, flat, usually sparsely pilose blades, and the yellowish rhizomes. An allied native species, *A. smithii* Rydb., differs in its pale rhizomes and its firm glaucous blades, soon involute in drying, the nerves prominent on the upper side. This species, called western wheat-grass and bluestem, is common west of the Mississippi River, where it is one of the most important native forage grasses. Another common species of this group is *A. dasystachyum* (Hook.) Scribn. (including *A. subvillosum* (Hook.) E. Nels.), found along the Great Lakes and westward.

Of the species without rhizomes seven have awnless or short-awned lemmas. The commonest species of this group is *A. tenerum* Vasey, called slender wheat-grass. This is an erect grass 2 to 4 feet high, with flat blades and slender spikes, the broad glumes nearly as long as the spikelet. It ranges from New England to Washington, and southward in the Western States to Mexico. Slender wheat-grass is an excellent forage grass and produces a good quality of hay. The seed is offered by a few western seedsmen. This species is the only native grass that has been successfully cultivated and whose seed is on the market.

One of the long-awned species, *Agropyron spicatum* (Pursh) Scribn. and Smith (*A. divergens* Nees), called bunch-grass, or more distinctively blue bunch wheatgrass, is of especial value as a forage grass. It is common in the Columbia Basin, where it is one of the chief range grasses. The species is distinguished by its erect bunchy habit and by the spreading awns of the lemmas, giving the spike a bristly appearance.

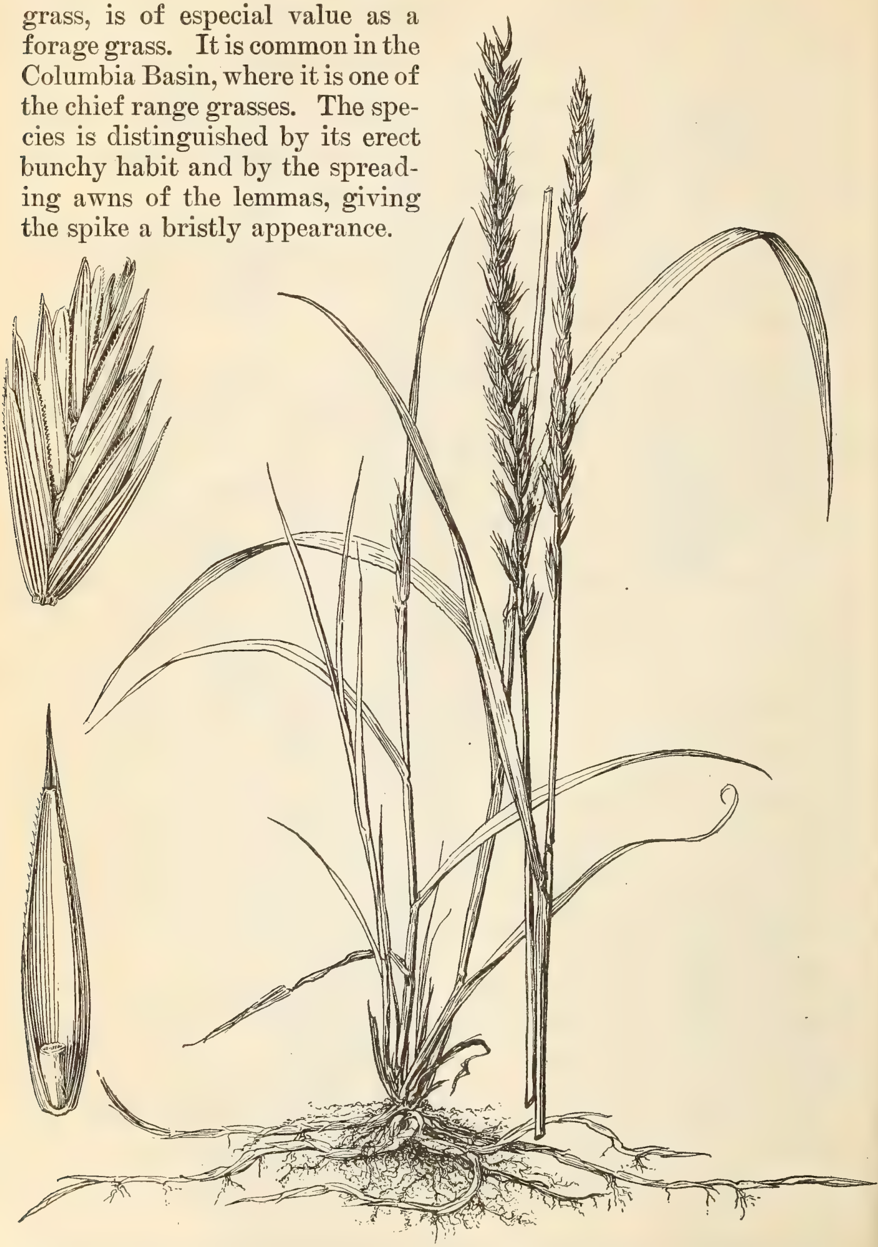
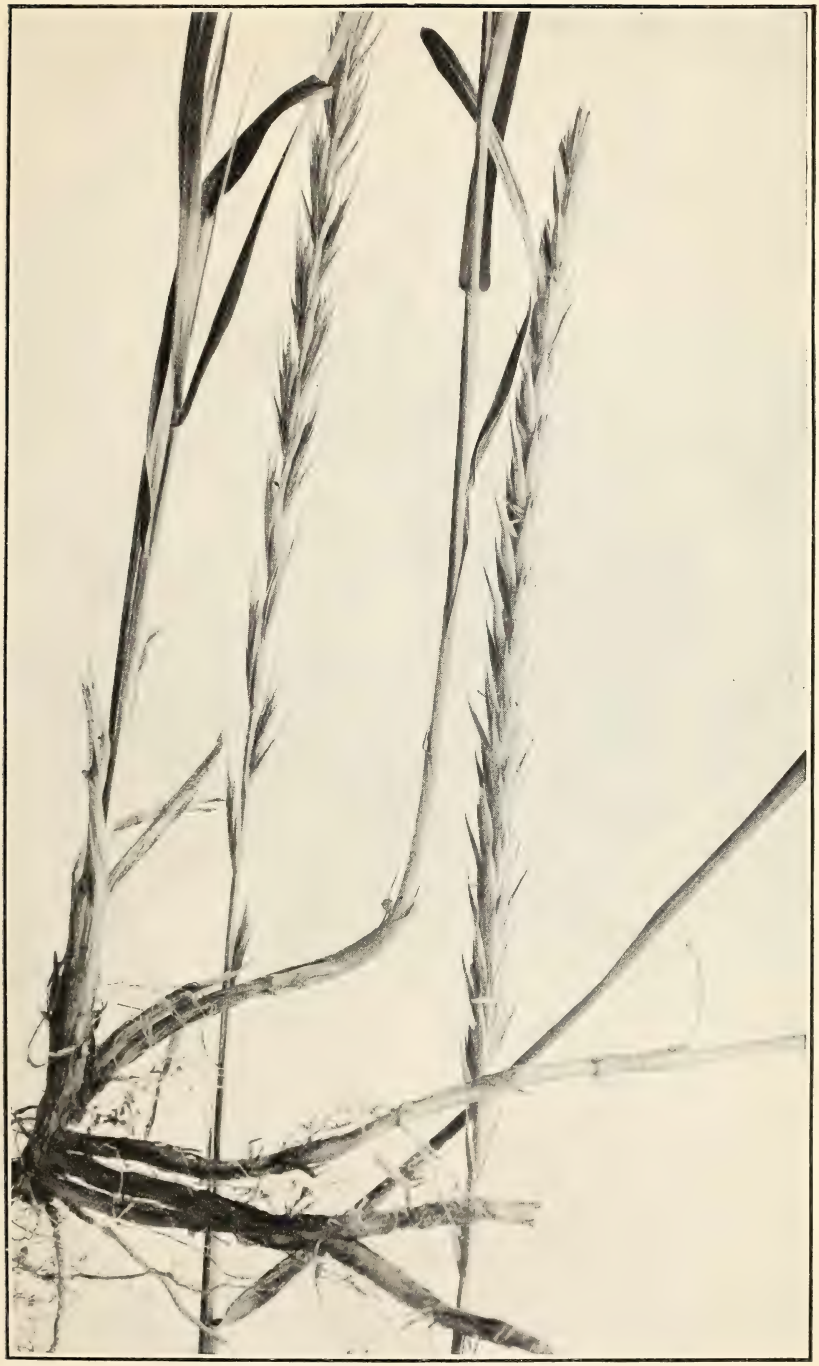
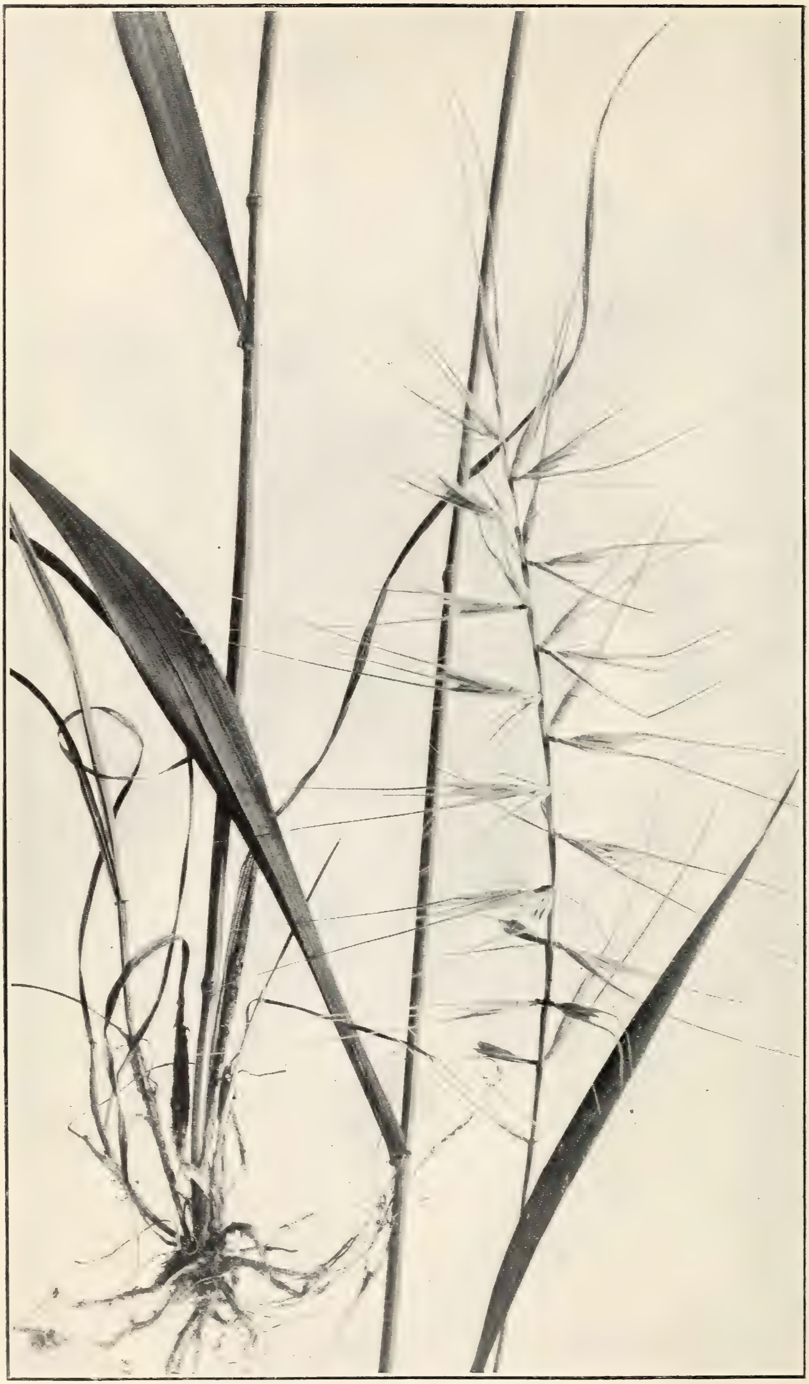


FIG. 43.—Quack-grass, *Agropyron repens*. Plant, × ½; spikelet, × 3; floret, × 5.

Two of our species have disarticulating spikes, thus approaching Sitanion. These are *Agropyron saxicola* (Scribn. and Smith) Piper, of Washington, and *A. scribneri* Vasey, a spreading mountain species



QUACK-GRASS (AGROPYRON REPENS).



BOTTLE-BRUSH GRASS (HYSTRIX PATULA).

A native species worthy of cultivation for ornament.

found at altitudes of 12,000 to 14,000 feet. In some species there are two spikelets at the nodes of the rachis. This is especially frequent in *A. smithii* and allies it with Elymus.

In general, all the species of Agropyron are forage grasses. They form an important part of the forage on the western range and in the valleys often grow in sufficient abundance to produce hay.

For a revision of the species of Agropyron found in the United States, see Scribner and Smith, U. S. Dept. Agr., Div. Agrost. Bull. 4:25–36. 1897.

34. Triticum L.

Spikelets 2 to 5 flowered, solitary, sessile, placed flatwise at each joint of a continuous or articulate rachis, the rachilla disarticulating above the glumes and between the florets or continuous; glumes rigid, 3 to several nerved, the apex abruptly mucronate or toothed or with one to many awns; lemmas keeled or rounded on the back, many-nerved, ending in one to several teeth or awns.

Annual, low or rather tall grasses, with flat blades and terminal spikes. Species about 10, southern Europe and western Asia; none in the United States except *Triticum aestivum*, the cultivated wheat.

Type species: *Triticum aestivum* L.

Triticum[1] L., Sp. Pl. 85, 1753; Gen. Pl., ed. 5, 37. 1754. Linnæus describes seven species, *T. aestivum*, *T. hybernum*, *T. turgidum*, *T. spelta*, *T. monococcum*, *T. repens*, *T. caninum*. The citation in the Genera Plantarum is to Tournefort's figures 292 and 293 which represent, the first, beardless wheat, and the second, bearded wheat. These two forms, beardless and bearded, are named by Linnæus *T. aestivum*, the bearded wheat, and *T. hybernum*, the beardless wheat. *Triticum aestivum* is chosen as the type because it has priority of position in the Species Plantarum. Linnæus divides the genus into two groups, "annua" and "perennia." The latter group, including *Triticum repens* and *T. caninum*, is now referred to Agropyron.

Zeia Lunell, Amer. Midl. Nat. 4: 225. 1915. Based on "*Triticum spelta* Linn." Agropyron Gaertn. is included in the genus proposed.

The most important species of Triticum is the cultivated wheat, *T. aestivum* L. (*T. vulgare* Vill., *T. sativum* Lam.). A large number of varieties are in cultivation, some with smooth lemmas, some with velvety lemmas, some with long awns (fig. 44), some awnless (fig. 44, *A*). Durum wheat and club wheat are races, each with several varieties. *Triticum monococcum* L., einkorn or 1-grained wheat, is grown sparingly in Europe. *Triticum dicoccum* Schrank, emmer, is cultivated in this country as a forage plant. In emmer the axis breaks up into joints, each joint bearing a spikelet which remains entire, each floret permanently inclosing its grain.[2]

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[1] In the Species Plantarum the word appears in the plural, Tritica, probably inadvertently.

[2] For a classification of wheats, see Jessen, Deutschlands Gräser 191, 1863; Körnicke, Handb. Getreidebaues 1: 40, 1885; Hackel in Engl. and Prantl, Pflanzenfam. II, 2: 80, 1887; True Grasses, translated by Scribner and Southworth, 180, 1890; Schulz, Mitt. Natf. Ges. Halle 1: 14. 1911. For an account of *T. dicoccoides* Körn., recently found by Aaronsohn on Mount Hermon, Palestine, see Aaronsohn, Verh. Zool. Bot. Ges. Wien 59: 485, 1909; U. S. Dept. Agr., Bur. Pl. Ind. Bull. 180: 38, 1910; Cook, U. S. Dept. Agr., Bur. Pl. Ind. Bull. 274. 1913.

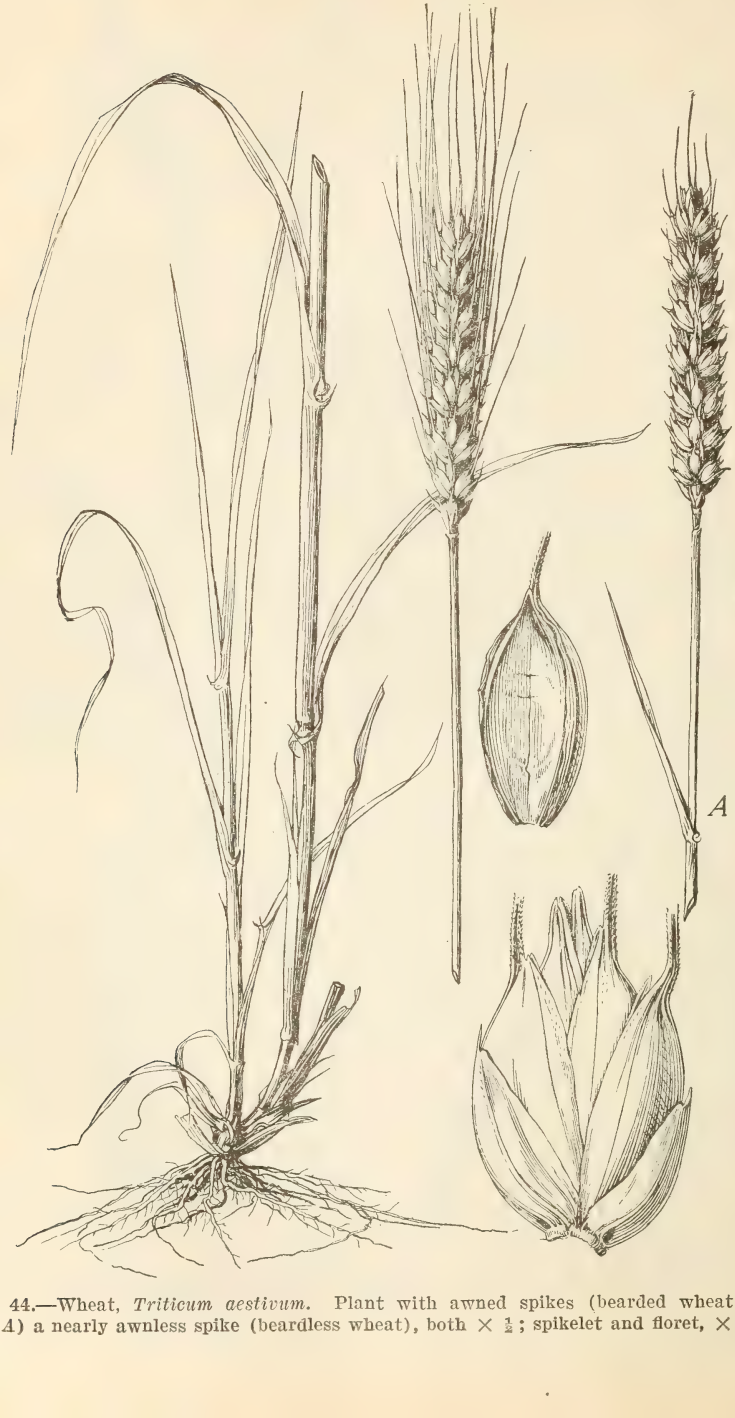

FIG. 44.—Wheat, *Triticum aestivum.* Plant with awned spikes (bearded wheat) and (*A*) a nearly awnless spike (beardless wheat), both × ½; spikelet and floret, × 3.

35. SECALE L.

Spikelets usually 2-flowered, solitary and sessile, placed flatwise against the rachis; the rachilla disarticulating above the glumes and produced beyond the upper floret as a minute stipe; glumes narrow, rigid, acuminate or subulate-pointed; lemmas broader, sharply keeled, 5-nerved, ciliate on the keel and exposed margins, tapering into a long awn.

Erect, mostly annual grasses, with flat blades and dense terminal spikes. Species five, in the temperate regions of Eurasia; one species cultivated in the United States and frequently escaped along waysides.

Type species: *Secale cereale* L.

Secale L., Sp. Pl. 84, 1753; Gen. Pl. 36. 1754. Linnæus describes four species: *S. cereale*, *S. villosum*, *S. orientale*, and *S. creticum*. The second species is now referred to Haynaldia, the third to Agropyron. The first species is chosen as the type, as it is a well-known economic species.

Secale cereale (fig. 45), common rye, is cultivated extensively in Europe and to some extent in the United States for the grain, but here it is frequently grown as a forage crop. Rye is used for winter forage in the South and for fall and spring pasture in the intermediate region, and for green feed farther north. It is also used for green manure and as a nurse crop for lawn mixtures, especially on public grounds when it is desired to cover the ground quickly with a green growth. Cultivated rye probably has been developed from the wild perennial European species *S. montanum* Guss. In the wild species of Secale the rachis disarticulates, but in *S. cereale* it is continuous.

36. SCRIBNERIA Hack.

Spikelets 1-flowered, solitary, appressed and lateral to the somewhat thickened continuous rachis, the rachilla disarticulating above the glumes, prolonged as a very minute hairy stipe; glumes equal, narrow, firm, acute, keeled on the outer nerves, the first 2-nerved, the second 4-nerved; floret with short hairs at the base; lemma shorter than the glumes, membranaceous, rounded on the back, obscurely nerved, the apex shortly bifid, the lobes obtuse, the faint midnerve extending as a slender straight awn; palea 2-nerved, about as long as the lemma.

Low annual, with slender cylindric spikes. Species one.

Type species: *Lepturus bolanderi* Thurb.

Scribneria Hack., Bot. Gaz. **11**: 105, pl. 5. 1886. One species described, based on *Lepturus bolanderi* Thurb.

The single species, *Scribneria bolanderi* (Thurb.) Hack. (fig. 46), is found in sandy sterile ground in the mountains from central California to Washington. It is too small and rare to be of economic importance.

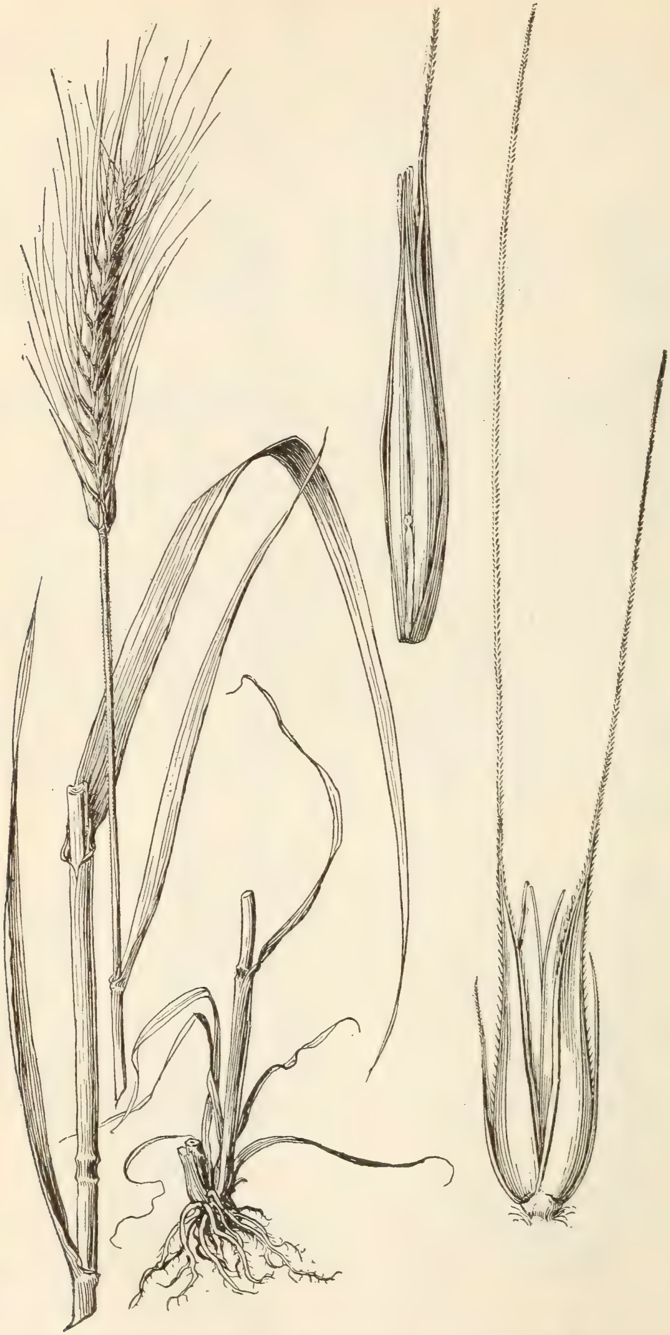

FIG. 45.—Rye, *Secale cereale.* Plant, × ½; spikelet, × 3; floret showing rudiment back of palea, × 5.

37. Elymus L.

Spikelets 2 to 6 flowered, sessile in pairs (rarely 3 or more or solitary) at each node of a continuous rachis, the florets dorsiventral to the rachis; rachilla disarticulating above the glumes and between the florets; glumes equal, usually rigid, sometimes indurate below, narrow, sometimes subulate, 1 to several nerved, acute to aristate, somewhat asymmetric and often placed in front of the spikelets; lemmas rounded on the back or nearly terete, obscurely 5-nerved, acute or usually awned from the tip.

Erect, usually rather tall grasses, with flat or rarely convolute blades and terminal spikes, the spikelets usually crowded, sometimes somewhat distant. Species about 45, in the temperate regions of the Northern Hemisphere; 25 species in the United States, most of them in the Western States.

Type species: *Elymus sibiricus* L.

Elymus L., Sp. Pl. 83, 1753; Gen. Pl., ed. 5, 36. 1754. Linnæus describes five species, *E. arenarius*, *E. sibiricus*, *E. canadensis*, *E. virginicus*, and *E. caput-medusae*, all of which are still retained in the genus. The first use of the name Elymus by Linnæus was in his Hortus Upsaliensis (1748), where two species are described, the first being cited in the Species Plantarum under *E. virginicus* the second under *E. sibiricus*. *Elymus sibiricus* is chosen as the type because it is the first of the five species in the Species Plantarum that is described in the Hortus Upsaliensis.

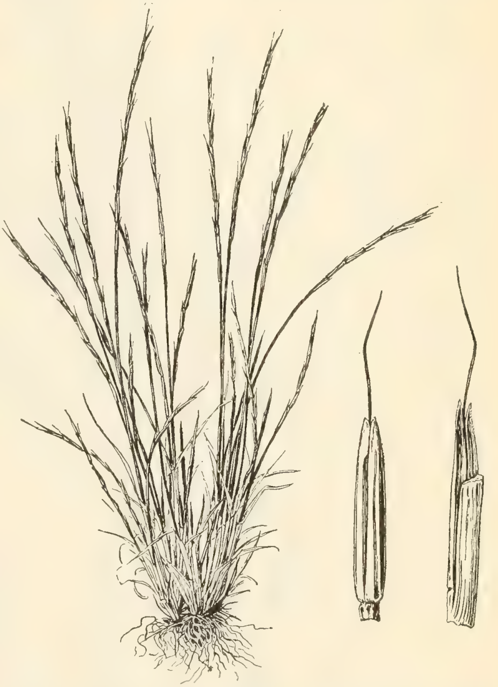

Fig. 46.—*Scribneria bolanderi*. Plant, × ½; spikelet with joint of rachis, × 5; the same, front view, × 5.

Terrellia Lunell, Amer. Midl. Nat. **4**: 227. 1915. Proposed for Elymus L., not Elymus of various ancient authors.

The asymmetric glumes, in many species standing in front of the spikelet instead of strictly distichous and in some species united at the very base, have been the object of investigations as to their morphological identity. Schenck[1] considers them to be developed from lateral branches at the base of the spikelet. Schuster[2] states that the first or outer glume originates as a single organ but soon divides into two parts, which stand side by side below the spikelet, the second glume being suppressed.

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[1] Bot. Jahrb. Engler **40**: 97–113. 1907.

[2] Flora **100**: 213–266, pl. 2–5. 1910.

In the group of *Elymus virginicus* L. and its allies the glumes are indurate at the base and bowed out. They stand in front of the spikelet rather than at each side, so that the contiguous glumes of the pair of spikelets are not back to back but side by side. In *E. arenarius* L., *E. glaucus* Buckl., and allied species, the glumes are less distinctly in front of the spikelets. The rachis of the spike is usually continuous but in *E. saundersii* Vasey, and, to a less extent, in *E. macounii* Vasey, the rachis disarticulates, showing a transition to Sitanion. In many species, such as *E. simplex* Scribn. and Merr., and *E. salina* Jones (named from Salina Pass), the middle spikelets are in pairs, but those toward the base and apex of the spike are single at the nodes. Such species are a transition to Agropyron. On the other hand *Agropyron smithii* often has one or more pairs of spikelets and may be considered a transition to Elymus. But in the former species the glumes are narrow or almost subulate, which shape is to be found in Elymus rather than in Agropyron. The spikelets are usually not more than two at each node of the rachis, but in *E. triticoides* Buckl. there are often, and in *E. condensatus* Presl. usually, more than two spikelets at each node. Sometimes in the latter species (rarely in the former) the spike is branched so that the inflorescence is a condensed panicle instead of a spike. *Elymus caput-medusae* L. is an annual introduced from Europe; the other species are native perennials. Some species form extensively creeping rhizomes, such as *Elymus mollis* Trin., of the sandy seacoasts of northern North America, *E. flavescens* Scribn. and Smith, of the interior dunes of the Columbia River basin, and *E. triticoides* Buckl., of alkaline soil of the Western States. *Elymus canadensis* L. (fig. 47) and *E. virginicus*, usually called wild rye, are common in the eastern half of the United States. The first has a bushy nodding head; the latter an erect, stiff head.

The species of Elymus are for the most part good forage grasses, and in some localities form a part of the native hay. In the wooded areas of the Northwest, *E. glaucus* Buckl. is one of the valuable secondary species on the ranges. It has flat, thin leaves, erect awned spikes, broad glumes, and no rhizomes.

38. SITANION Raf.

Spikelets 2 to few flowered, the uppermost floret reduced, sessile, usually 2 at each node of a disarticulating rachis, the rachis breaking at the base of each joint, remaining attached as a pointed stipe to the spikelets above; glumes narrow or setaceous, 1 to 3 nerved, the nerves prominent, extending into one to several awns, these (when more than one) irregular in size, sometimes mere lateral

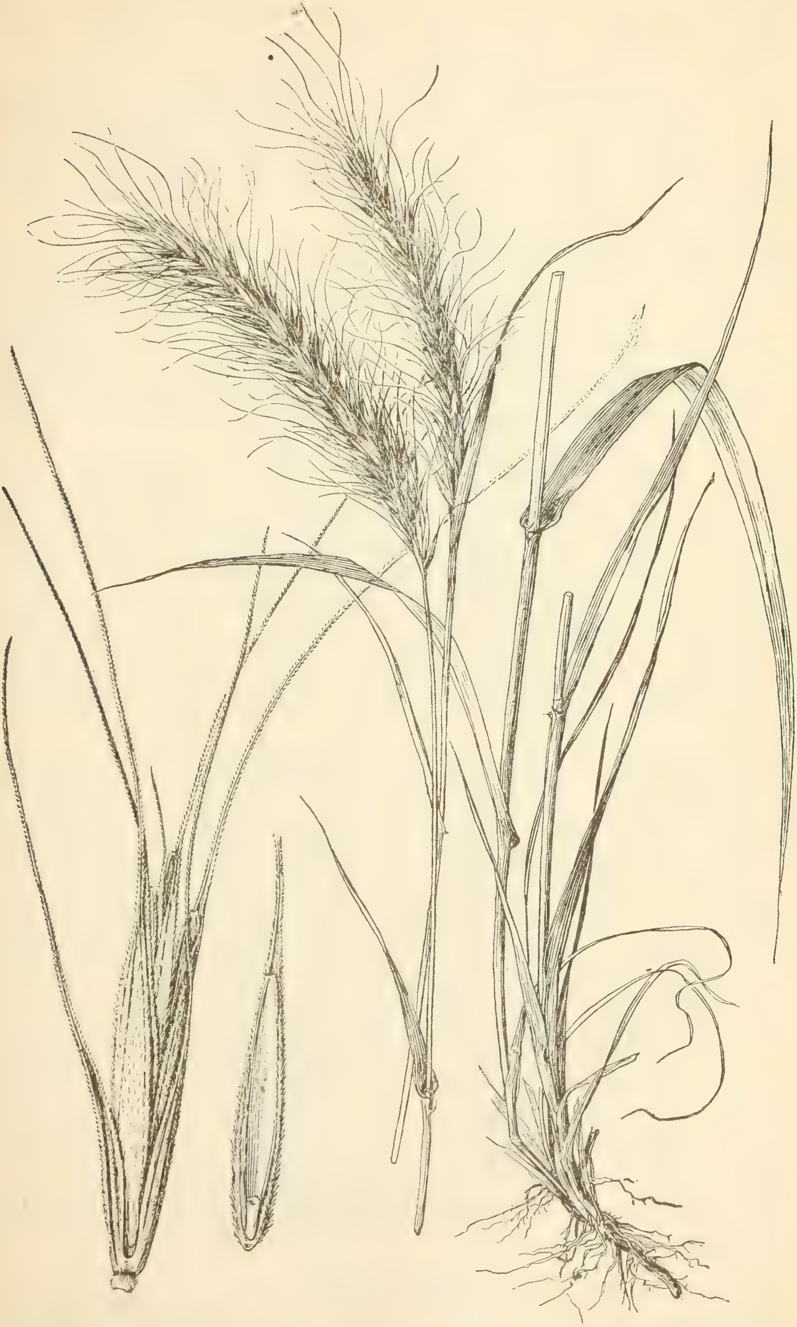

FIG. 47.—Wild rye, *Elymus canadensis*. Plant, × ½; spikelet and floret, × 3.

appendages of the long central awn, sometimes equal, the glume being bifid; lemmas firm, convex on the back, nearly terete, the apex slightly 2-toothed, 5-nerved, the nerves obscure, the central nerve extending into a long, slender, finally spreading awn, sometimes one or more of the lateral nerves also extending into short awns; palea firm, nearly as long as the body of the lemma, the two keels serrulate.

Low or rather tall cespitose perennials, with bristly spikes. Species about six, in the dry regions of the western United States.

Type species: *Sitanion elymoides* Raf.

Sitanion Raf., Journ. de Phys. **89**: 103. 1819. One species is described, which is the same as *Aegilops hystrix* Nutt.

Polyanthrix Nees, Ann. Nat. Hist. ser. 1. **1**: 284. 1838. A single species based on *Aegilops hystrix* Nutt., which is *Sitanion hystrix* (Nutt.) J. G. Smith.

This genus is closely related to Elymus, and until recent years has been almost universally included in it. The characters which separate Sitanion are the disarticulating rachis, together with the slender glumes and long-awned lemmas.

There are three groups of species. *Sitanion planifolium* J. G. Smith and its allies have lanceolate rather than setaceous glumes, which are usually 1-awned or occasionally 2-awned. The awns are less spreading and the rachis disarticulates rather tardily. These species are found from California to Washington.

A second series, including *Sitanion jubatum* J. G. Smith and its allies, has glumes cleft nearly to the base into three to several setaceous lobes. These species also are confined to the Pacific Coast States.

The third series includes Nuttall's original species, *Sitanion hystrix* (Nutt.) J. G. Smith (fig. 48) and several allied species, found from the Great Plains to the Pacific coast. In some, the glumes are setaceous and entire; in others, some of the glumes are cleft into two equal, or usually unequal, awned lobes.

The species of the three groups differ among themselves by only slight characters, and each group may represent several closely allied species or a single species with several forms or varieties.

When young all the species furnish forage, but at maturity the disarticulated joints of the spike, with their pointed rachis joints and long-awned spikelets, are blown about by the wind and often cause injury to stock, penetrating the nose and ears, working in by means of the forwardly roughened awns, and causing inflammation. The species are generally known as squirreltail or foxtail grasses.

For a revision of the genus, see Smith, U. S. Dept. Agr., Div. Agrost. Bull. 18. 1899.

39. HYSTRIX Moench.

Spikelets 2 to 4 flowered, sessile, 1 to 3 at each node of a continuous flattened rachis, horizontally spreading at maturity;

glumes reduced to short or minute awns, the first usually obsolete, both often wanting in the upper spikelets; lemmas convex, rigid, tapering into long awns, 5-nerved, the nerves obscure except toward the tip; palea about as long as the body of the lemma.

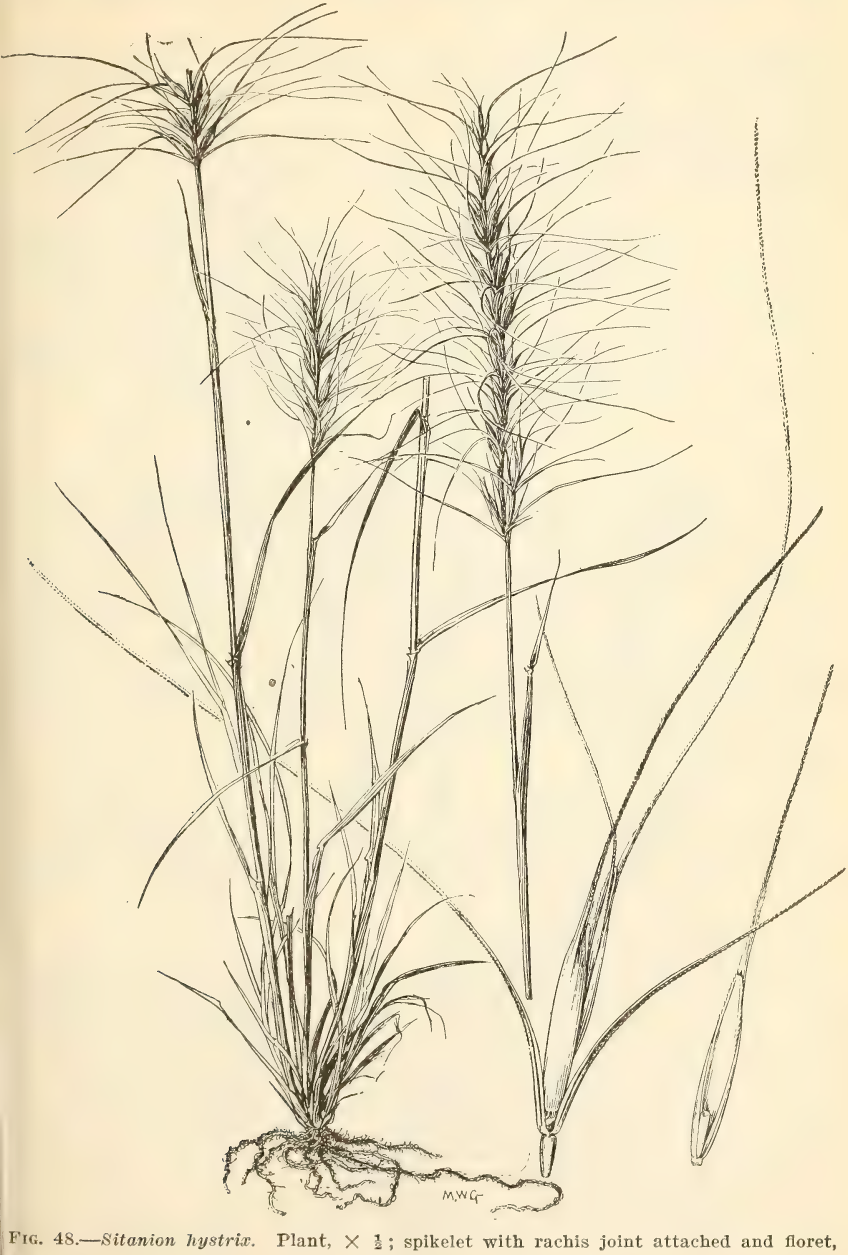

FIG. 48.—*Sitanion hystrix.* Plant, × ½; spikelet with rachis joint attached and floret, × 3.

Erect perennials, with flat blades and bristly, loosely flowered spikes. Species four, in temperate regions; one in the Himalayas, one in New Zealand, and two in the United States.

Type species: *Elymus hystrix* L.

Asperella Humb., Magaz. Bot. Roem. and Usteri **7**: 5, 1790, not Asprella Schreb., 1789, a typonym of Homalocenchrus Mieg. A single species, *A. hystrix*, based on *Elymus hystrix* L.

Hystrix Moench, Meth. Pl. 294. 1794. One species described, *H. patula*, based on *Elymus hystrix* L.

Gymnostichum Schreb., Beschr. Gräs. **3**: 127, pl. 47. 1810. One species described, *G. hystrix*, based on *Elymus hystrix* L.

Our species are both woodland grasses, one, *Hystrix patula* Moench (*H. hystrix* (L.) Millsp.) (Pl. X; fig. 49), in the Mississippi Valley and eastward; the other, *H. californica* (Boland.) Kuntze, in western central California. They have little forage value, as they are nowhere abundant. The first species mentioned, sometimes called bottle-brush grass, is worthy of cultivation for ornament.

40. HORDEUM L.

Spikelets 1-flowered, 3 (sometimes 2) together at each node of the articulate rachis (continuous in *Hordeum vulgare*), the back of the lemma turned from the rachis, the middle one sessile or subsessile, the lateral ones pediceled; rachilla disarticulating above the glumes and, in the central spikelet, prolonged behind the palea as a bristle and sometimes bearing a rudimentary floret; lateral spikelets usually imperfect, sometimes reduced to bristles; glumes narrow, often subulate and awned, rigid, standing in front of the spikelet; lemmas rounded on the back, 5-nerved, usually obscurely so, tapering into a usually long awn.

Annual or perennial low or rather tall grasses, with flat blades and dense terminal cylindric spikes. Species about 20, in the temperate regions of both hemispheres; 10 species in the United States, 3 being introduced from Europe.

Type species: *Hordeum vulgare* L.

Hordeum L., Sp. Pl. 84, 1753; Gen. Pl., ed. 5, 37. 1754. Linnæus describes six species, *H. vulgare*, *H. hexastichon*, *H. distichon*, *H. zeocriton*, *H. murinum*, and *H. jubatum*. The citation given in the Genera Plantarum is to Tournefort's plate 295, which represents *Hordeum vulgare*. This species is therefore the type. All the Linnæan species are retained in the genus at present, but the first four are usually considered to be forms of one species.

Zeocriton Beauv., Ess. Agrost. 114, pl. 21, f. 2. 1812. Ten species of Hordeum having staminate or sterile lateral spikelets are included; *H. distichum*, the species figured, is taken as the type.

Critesion Raf., Journ. de Phys. **89**: 103. 1819. A single species is described, *C. geniculatus* Raf. This is *Hordeum jubatum* L.

The most important species of the genus is *Hordeum vulgare* (fig. 50), the cultivated barley. This is an annual, resembling bearded wheat, the awns as much as 6 inches long. In common or 4-rowed barley the 3 spikelets of each cluster are fertile, the lateral spikelets of the opposite sides of the spike being imbricate in a row, so that the spike appears to be 4-rowed. In 6-rowed barley (*H. hexastichon* L.) the lateral spikelets form rather distinct rows. In 2-rowed barley (*H. distichon* L.) the lateral spikelets are all infertile and reduced.

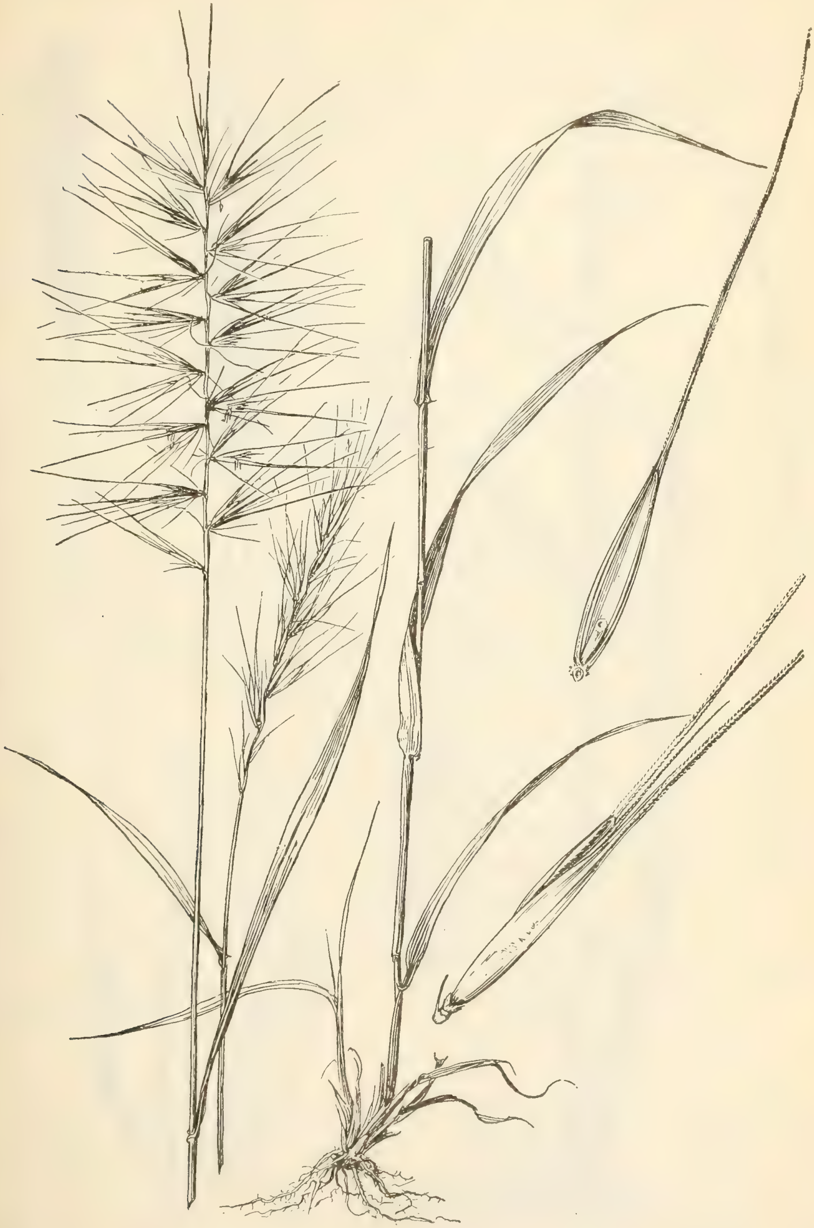

FIG. 49.—Bottle-brush grass, *Hystrix patula*. Plant, × ½; spikelet and floret, × 3.

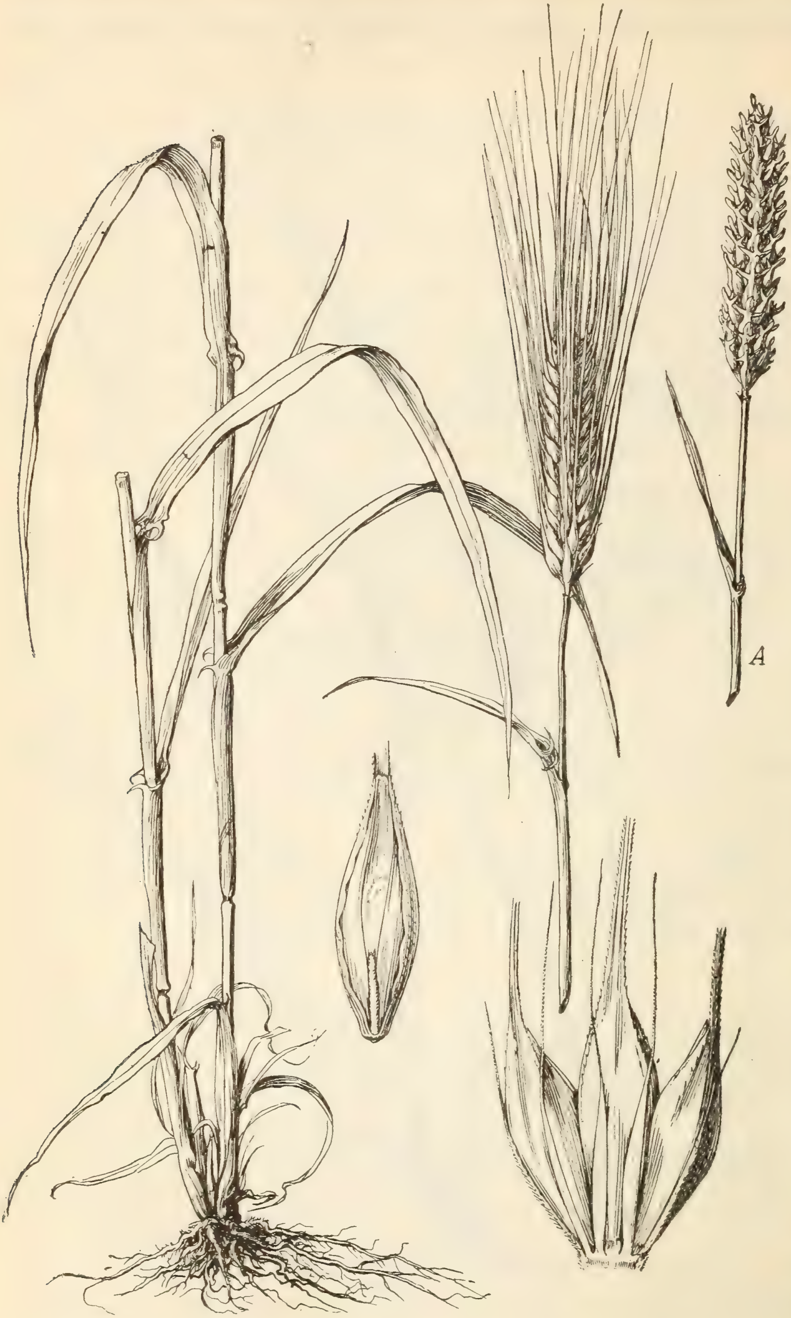

FIG. 50.—Barley, *Hordeum vulgare*. Plant, × ½; *A*, a spike of beardless barley, × ½; group of three spikelets and a floret, the latter showing the rudiment back of the palea, × 3.

so that only the row of central spikelets on each side of the spike is prominent. Naked barley is a kind of 2-rowed barley in which the grain is free from the lemma and palea. Rice barley (*H. zeocriton* L.), with spreading spikelets and divergent awns, is not grown in this country and but sparingly in Europe. Beardless barley (*H. vulgare trifurcatum* Wenderoth) (fig. 50, *A*) is a variety of 6-rowed barley in which the awns are suppressed or converted into irregular short lobes or teeth. Schulz[1] divides the cultivated barleys into two groups. The first group, derived from *H. spontaneum* Koch, includes the 2-rowed varieties. The second group, derived from *H. ischnatherum* (Coss.) Schulz, includes the 4 and 6 rowed varieties. The glumes of Hordeum are thought by Schenck to be sterile spikelets or branchlets. (See footnote under Elymus, p. 93.)

Three common species of Hordeum are annuals. One of these, *H. pusillum* Nutt., with glumes broadened above the base, is a native species. The other two, introduced from Europe, are common weeds on the Pacific coast. In *H. murinum* L. a part of the glumes are ciliate; in *H. gussoneanum* Parl. the glumes are setaceous, smooth below. *Hordeum nodosum* L. (fig. 51) is similar to *H. pusillum* but differs in being perennial and in having uniformly subulate glumes. This species is abundant throughout the western half of the United States. Another perennial species, *H. jubatum* L., called squirreltail grass because of its soft brushlike spikes, is common in the Western States, where it is not infrequently a troublesome weed in alfalfa fields. This species is called foxtail in Wyoming, barley grass in Utah, and tickle grass in Nevada. *Hordeum murinum*, mentioned above, is called barley grass, foxtail, and wild barley in different localities.

The species of Hordeum furnish forage during the early stages of growth before the awns are produced. The mature spikes break up into sharp-pointed joints that become a serious pest to stock. These joints with the forwardly roughened awns work into the eyes and nostrils of animals, causing inflammation.

For a revision of the species of Hordeum found in the United States, see Scribner and Smith, U. S. Dept. Agr., Div. Agrost. Bull. **4:**23–25. 1897.

41. LOLIUM L.

Spikelets several-flowered, solitary and sessile, placed edgewise to the continuous rachis, one edge fitting to the alternate concavities, the rachilla disarticulating above the glumes and between the florets; first glume wanting (except on the terminal spikelet), the second outward, strongly 3 to 5 nerved, equaling or exceeding the second floret; lemmas rounded on the back, 5 to 7 nerved, obtuse, acute, or awned.

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[1] Mitt. Natf. Ges. Halle **1:** 18. 1911.

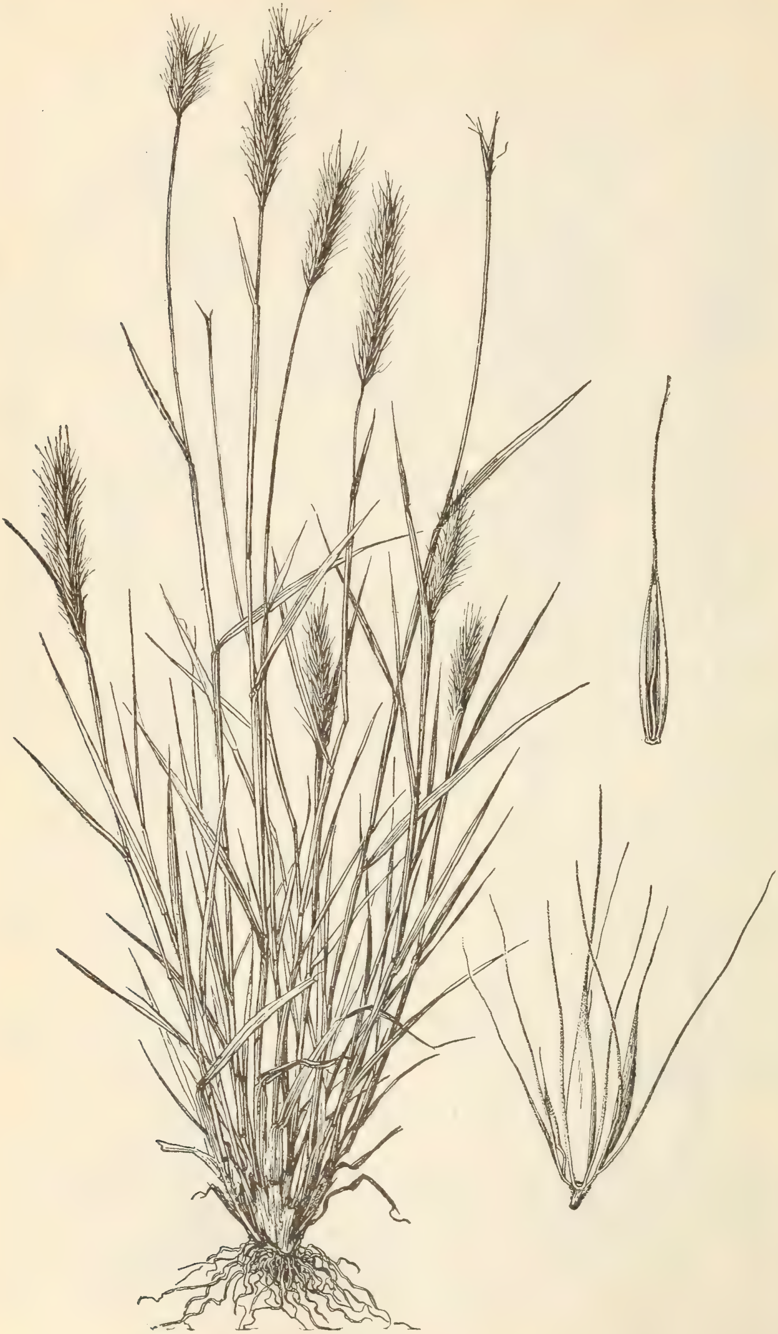


FIG. 51.—*Hordeum nodosum.* Plant, × ½; group of three spikelets with rachis joint attached and a floret, the latter showing the rudiment back of the palea, × 3.

Annuals or perennials, with flat blades and simple terminal flat spikes. Species about eight, in Eurasia, four of these being introduced in the United States.

Type species: *Lolium perenne* L.

Lolium L., Sp. Pl. 83, 1753; Gen. Pl., ed. 5, 36. 1754. Linnæus describes two species, *L. perenne* and *L. temulentum.* The first is chosen as the type, as it is an economic species. Both were described in the flora of Sweden.

Two species are of agricultural importance. *Lolium perenne*, English or perennial rye-grass, was the first meadow grass to be cultivated in Europe as a distinct segregated species, the meadows and pastures formerly being mixed native species. This and the next are probably the most important of the European forage grasses. English rye-grass is a biennial or short-lived perennial, 2 to 3 feet tall, with glossy dark-green leaves and a slender spike as much as a foot long, the spikelets 8 to 10 flowered, somewhat longer than the glume, the lemmas awnless. Italian rye-grass, *L. multiflorum* Lam. (*L. italicum* A. Br.) (Pl. XI; fig. 52), differs from the preceding in having awned lemmas and usually a greater number of florets to the spikelet. Both species are used to a limited extent for meadow, pasture, and lawn. They are of some importance in the South for winter forage. *Lolium multiflorum* is common in the humid region of the Pacific coast, where it is often called Australian rye-grass.

In the Eastern States the rye-grasses are often sown in mixtures for parks or public grounds, where a vigorous early growth is required. The young plants can be distinguished from bluegrass by the glossy dark-green foliage.

Lolium temulentum L., darnel, is occasionally found as a weed in grain fields and waste places. It is in bad repute, because of the presence in the fruit of a narcotic poison, said to be due to a fungus. Darnel is supposed to be the plant referred to as the tares sown by the enemy in the parable of Scripture. It is an annual, with glumes as much as an inch long and exceeding the 5 to 7 florets.

42. LEPTURUS R. Br.
(*Monerma* Beauv.)

Spikelets 1-flowered, embedded in the hard, cylindric, articulate rachis, placed edgewise thereto, the first glume wanting except on the terminal spikelet, the second glume closing the cavity of the rachis and flush with the surface, indurate, nerved, acuminate, longer than the joint of the rachis; lemma lying next the rachis, hyaline, shorter than the glume, 3-nerved; palea hyaline, 2-nerved, a little shorter than the lemma; rachilla not disjointing, the spikelet falling entire, attached to its rachis joint.

Low annuals or perennials, with hard cylindric spikes. Species three, all from the Eastern Hemisphere, one introduced in California.

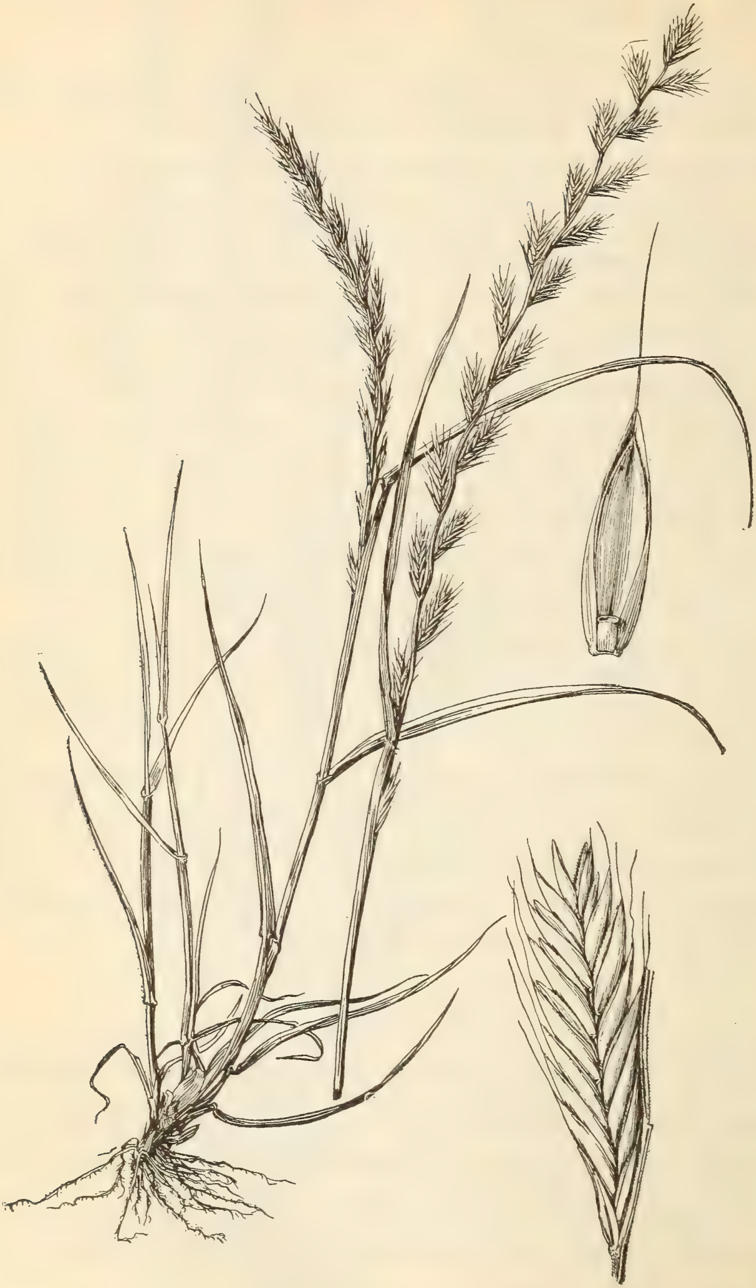
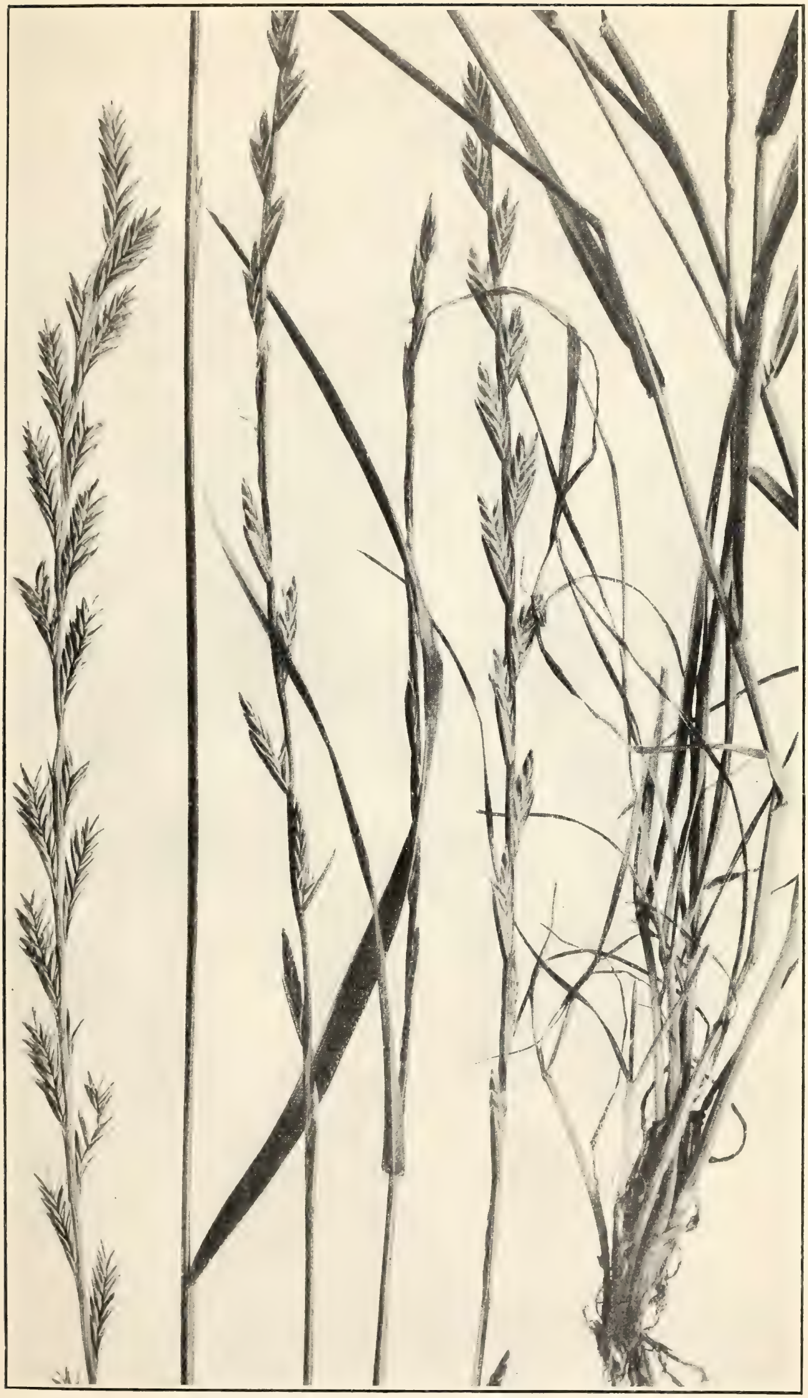
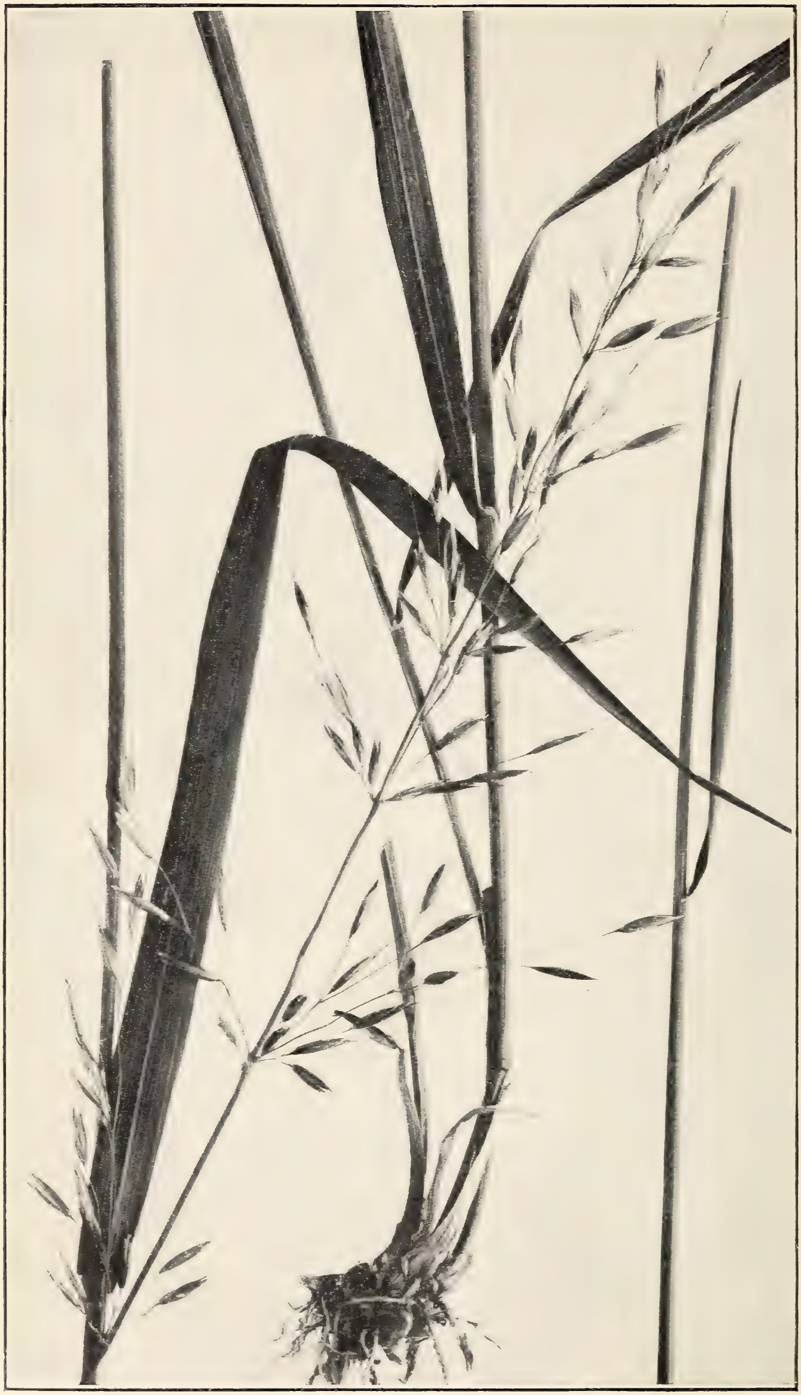


FIG. 52.—Italian rye-grass, *Lolium multiflorum*. Plant, × ½; spikelet, × 3; floret, × 5.



ITALIAN RYE-GRASS (LOLIUM MULTIFLORUM).



TALL OAT-GRASS (ARRHENATHERUM ELATIUS).

Type species: *Rottboellia repens* Forst.

Lepturus R. Br., Prodr. Fl. Nov. Holl. 207. 1810. One species described, *L. repens*, based on *Rottboellia repens* Forst.

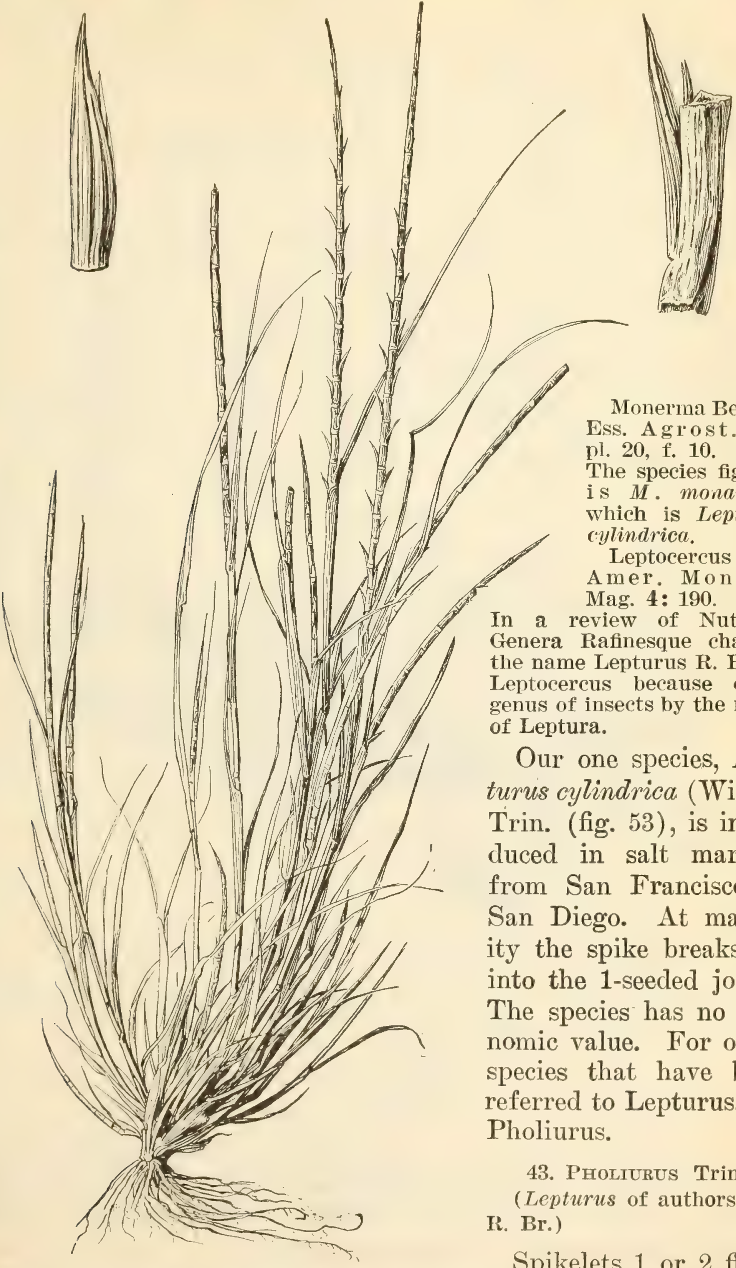


Fig. 53.—*Lepturus cylindrica.* Plant, × ½; spikelet with a joint of the rachis, × 5; spikelet, front view, × 5.

Monerma Beauv., Ess. Agrost. 116, pl. 20, f. 10. 1812. The species figured is *M. monandra*, which is *Lepturus cylindrica.*

Leptocercus Raf., Amer. Monthly Mag. **4:** 190. 1819. In a review of Nuttall's Genera Rafinesque changes the name Lepturus R. Br. to Leptocercus because of a genus of insects by the name of Leptura.

Our one species, *Lepturus cylindrica* (Willd.) Trin. (fig. 53), is introduced in salt marshes from San Francisco to San Diego. At maturity the spike breaks up into the 1-seeded joints. The species has no economic value. For other species that have been referred to Lepturus, see Pholiurus.

43. PHOLIURUS Trin.

(*Lepturus* of authors, not R. Br.)

Spikelets 1 or 2 flowered, embedded in the articulate rachis and falling attached to the joints; glumes two, placed in front of the spikelet and inclosing it, coriaceous, 5-nerved, acute, asymmetric, appearing like halves of a single split glume; lemma lying next to the axis, smaller than the glumes, hyaline, keeled, scarcely more than 1-nerved; palea a little shorter than the lemma, hyaline, 2-nerved.

Low annuals, with cylindric spikes. Species four, in the Eastern Hemisphere, one introduced into the United States.

Type species: *Rottboellia pannonica* Host.

Pholiurus Trin., Fund. Agrost. 131. 1820. Based on a single species, *Rottboellia pannonica* Host. This species has 2-flowered spikelets.

Lepiurus Dumort., Obs. Gram. Belge 140, pl. 15, f. 57. 1823. A single species based on "Rottbolia incurvata L." fils.

The species of Pholiurus have been referred by most recent authors to Lepturus, the type of which was, by the same authors, referred to Monerma.

Our species, *Pholiurus incurvatus* (L). Hitchc. (*Aegilops incurvata* L.,[1] *Lepturus filiformis* (Roth.) Trin.) (fig. 54), has 1-flowered spikelets. It is introduced along the borders of salt marshes from Maryland to Virginia and from Marin County to San Diego, Calif. It has no economic value.

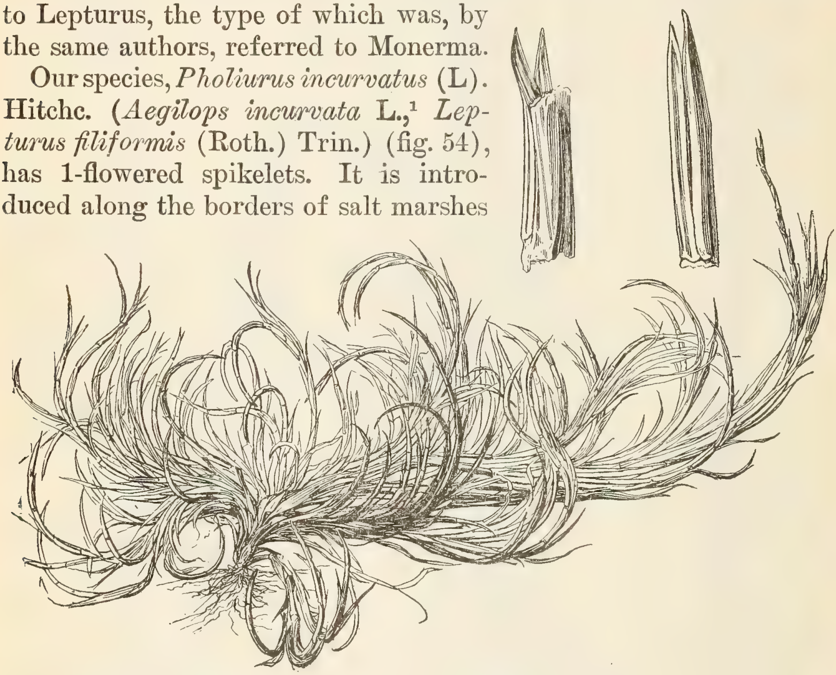


Fig. 54.—*Pholiurus incurvatus.* Plant, × ½; spikelet with a joint of the rachis, × 5; spikelet, front view, × 5.

4. AVENEAE, THE OAT TRIBE.

44. Koeleria Pers.

Spikelets 2 to 4 flowered, compressed, the rachilla disarticulating above the glumes and between the florets, prolonged beyond the perfect florets as a slender bristle or bearing a reduced or sterile floret at the tip; glumes usually about equal in length but unequal in shape, the lower narrow and sometimes shorter, 1-nerved, the upper somewhat broader above the middle, wider than the lower, 3 to 5 nerved;

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[1] Sp. Pl. ed. 2, 2: 1490. 1763.

lemmas somewhat scarious and shining, the lowermost a little longer than the glume, obscurely 5-nerved, acute or short-awned, the awn, if present, borne just below the apex.

Annual or perennial, slender, low or rather tall grasses, with narrow blades and spikelike panicles. Species about 20, in the temperate regions of both hemispheres; two species in the United States, one native and one introduced.

Type species: *Aira cristata* L.

Koeleria Pers., Syn. Pl. 1: 97. 1805. Persoon describes five species, *K. gracilis*, *K. cristata*, *K. tuberosa*, *K. phleoides*, and *K. villosa*. Of these, *K. cristata* and *K. phleoides* were described by Linnæus, the first under Aira, the second under Festuca. The first of these is selected as the type, as it has priority of position in the Species Plantarum.

Airochloa Link, Hort. Berol, 1: 126. 1827. Six species are included. *Koeleria cristata*, upon which the first species is based, is taken as the type.

Brachystylus Dulac, Fl. Hautes Pyr. 85. 1867. Based on "Koeleria Pers."

Recently a monograph of Koeleria was published by Domin[1] in which many species were described. Several of these were based upon material from the United States but appear to be only forms of the widely distributed *K. cristata*.

Koeleria cristata (L.) Pers. (fig. 55) is the only species native in North America. This is a common constituent of grassland on prairies, plains, and in open woods from Ontario to British Columbia and south to northern Mexico. It is a cespitose perennial, with slender, erect culms a foot or two high, with a pale, shining, densely flowered panicle 2 to 5 inches long. The species varies much, but the forms, except *K. cristata longifolia* Vasey, of California, with longer blades and larger, more open panicles, can not be distinguished as varieties. The slender form, of the semiarid plains and foothills of the West, is held by some as distinct and called *K. gracilis* Pers. The spikelets of *K. cristata* are mostly 2 or 3 flowered, with a slender prolongation of the rachilla, and the lemmas are acute or mucronate, but not awned. The habit suggests a species of Poa, from which genus it is distinguished by its mostly 2 or 3 flowered spikelets, acute lemmas, and the culm puberulent below the panicle. A second species, *K. phleoides* (Vill.) Pers., a low annual with short-awned lemmas, is introduced from Europe in a few localities. Hackel (Nat. Pflanzenfam.) places Koeleria in the Festuceæ, but South American and Old World species of Koeleria, with lemmas awned below the apex, as well as the shining culm and spikelets of *K. cristata*, show clearly an affinity to Trisetum. For this reason the genus is here placed in Aveneae, although the glumes do not exceed the florets as they do in nearly all the Aveneae.

Koeleria cristata is a good forage grass and is a constituent of much of the native pasture throughout the Western States.

45. TRISETUM Pers.

Spikelets usually 2-flowered, sometimes 3 to 5 flowered, the rachilla prolonged behind the upper floret, usually villous; glumes somewhat unequal, acute, awnless, the second usually longer than the first floret; lemmas usually short-bearded at the base, 2-toothed at the apex, the teeth often awned, bearing from the back below the cleft apex a straight and included, or usually bent and exserted, awn.

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[1] Monographie der Gattung Koeleria. 1907.

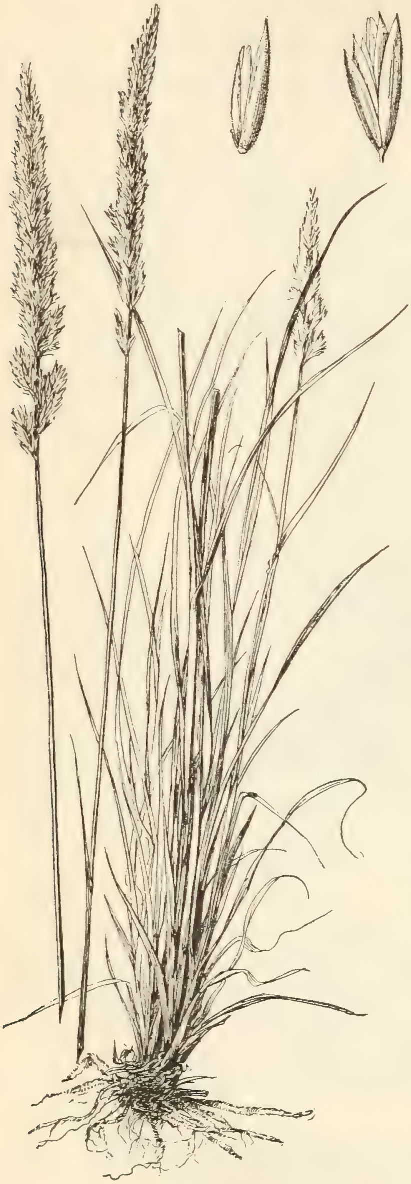

FIG. 55.—*Koeleria cristata.* Plant, × ½; spikelet and floret, × 5.

Tufted perennials with flat blades and open or usually contracted or spikelike panicles. Species about 65, in the arctic and temperate regions of both hemispheres; eight species in the United States, mostly in the mountains.

Type species: *Avena flavescens* L.

Trisetum Pers., Syn. Pl. **1**: 97. 1805. Persoon describes 11 species. The seventh species, *T. pratense* Pers., based on *Avena flavescens* L., is chosen as the type, because it is historically the oldest species.

Graphephorum Desv., Nouv. Bull. Soc. Philom. Paris **2**: 189. 1810. Based on *Aira melicoides* Michx.

The name Trisetum refers to the three awns on the lemma of many of the species, one from the back and one from each of the teeth. In two of our species, *T. melicoideum* (Michx.) Scribn. and *T. wolfii* Vasey, the awn from the back is included within the glume or is wanting. *Trisetum spicatum* (L.) Richter (fig. 56) is found at high altitudes in all the western mountains and is widespread at high altitudes and in the arctic regions of the Northern Hemisphere. It is an erect grass with a spikelike, often dark-colored panicle, the awn exserted and bent. *Trisetum canescens* Buckl., of the Western States, is a woodland grass with narrow but rather loose panicles. *Trisetum cernuum* Trin., of the Northwest, has broad flat blades and a loose open penicle, with lax drooping branches, the florets distant in the usually 3-flowered spikelets. *Trisetum pennsylvanicum* (L.) Roem. and Schult. (*Sphenopholis palustris* (Michx.) Scribn.), *T. hallii* Scribn., and *T. interruptum* Buckl. have been referred to Sphenopholis. In the first, the upper lemma is slightly bearded at base, the lower glabrous; in the other two, the lemmas are glabrous. In these three species the articulation is below the spikelet, as in Sphenopholis, for which reason Scribner placed them in that genus, but their awned, relatively thin lemmas and their glumes alike in shape place them more naturally in Trisetum.

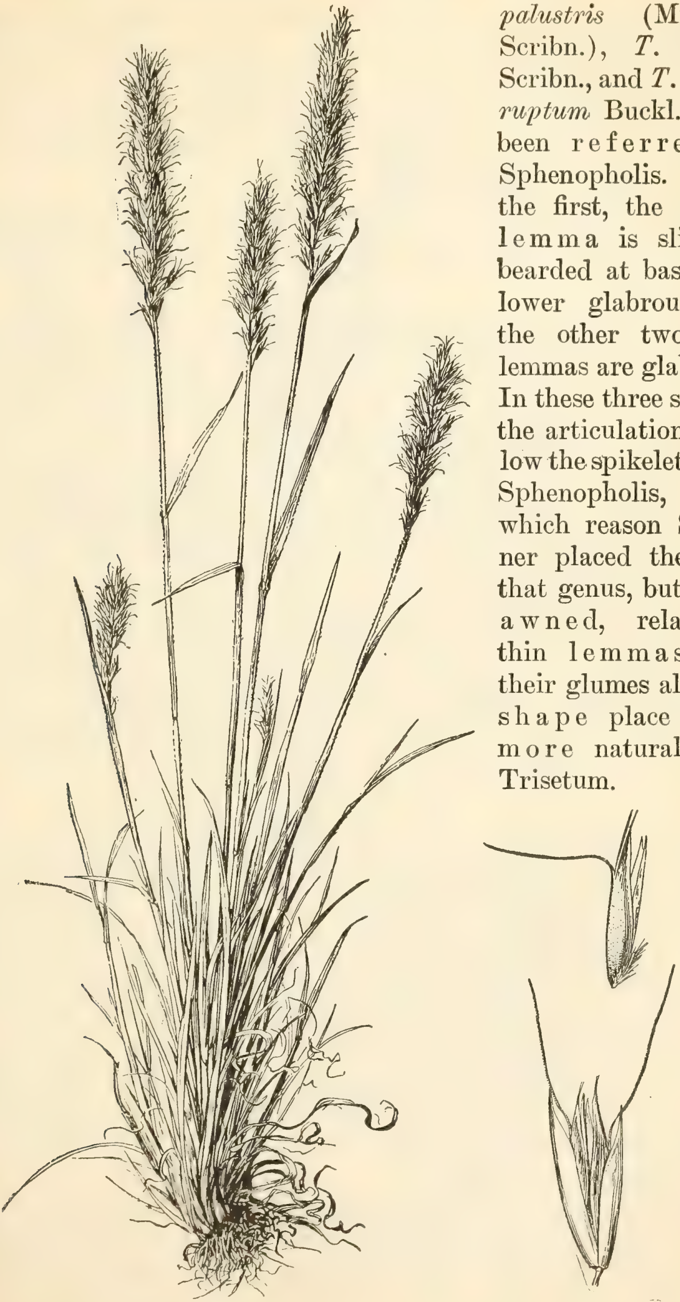

FIG. 56.—*Trisetum spicatum.* Plant, × ½; spikelet and floret, × 5.

The species of Trisetum are all valuable for grazing. *Trisetum spicatum* constitutes an important part of the forage on alpine slopes.

46. SPHENOPHOLIS Scribn.

(*Eatonia* of authors, not Raf.)

Spikelets 2 or 3 flowered, the pedicel disarticulating below the glumes, the rachilla produced beyond the upper floret as a slender bristle; glumes unlike in shape, the first narrow, acute, 1-nerved, the second broadly obovate, 3 to 5 nerved, somewhat coriaceous; lemmas firm, scarcely nerved, awnless, the first a little shorter or a little longer than the second glume.

Perennial grasses, with usually flat blades and narrow panicles. Species four, in the United States, extending into Mexico and the West Indies.

Type species: *Aira obtusata* Michx.

Reboulea Kunth, Rev. Gram. **1**: 341, pl. 84, 1830, not Rebouillia Raddi, 1818. *R. gracilis*, the only species described, is the same as *Aira obtusata* Michx.

Colobanthus (Trin.) Spach. Suites Buff. **13**: 163, 1846, not Bartl., 1830. Trinius applied the name to a section of Trisetum. The type is *Koeleria pennsylvanica* DC. (*Sphenopholis pallens*), the first of two species mentioned by Trinius, the other being *Aira obtusata* Michx.

Sphenopholis Scribn., Rhodora **8**: 142. 1906. A new name is proposed for the group of grasses then known as Eatonia, and the type species is designated. Scribner showed that the original description of Eatonia Raf. could not apply to the genus as later described by Endlicher.[1] The type species of Eatonia Raf. proves to be *Panicum virgatum*.[2] The genus Sphenopholis was revised by Scribner in the above-mentioned paper.

One species, *Sphenopholis obtusata* (Michx.) Scribn. (fig. 57), is widespread, but not very abundant, throughout the eastern half of the United States. In the western portion of its range the panicle is condensed and spikelike (var. *lobata* (Trin.) Scribn.). All the species are forage grasses, but they are usually not abundant enough to be of much importance.

47. AVENA L., oats.

Spikelets 2 to several flowered, the rachilla bearded, disarticulating above the glumes and between the florets; glumes about equal, membranaceous or papery, several-nerved, longer than the lower floret, usually exceeding the upper floret; lemmas indurate, except toward the summit, 5 to 9 nerved, bidentate at the apex, bearing a dorsal bent and twisted awn (this straight and reduced in *Avena sativa*).

Annual or perennial, low or moderately tall grasses, with narrow or open, usually rather few-flowered panicles of usually large spikelets. Species about 55, in the temperate regions; only a few in the Western Hemisphere; 7 species in the United States, only 2 being native.

Type species: *Avena sativa* L.

Avena L., Sp. Pl. 79, 1753; Gen. Pl., ed. 5, 34. 1754. Linnæus describes 10 species, 3 of which are now retained in Avena. These are *A. sativa*, *A. fatua*, and *A. pratensis*. The other species are now referred as follows: *A. sibirica* to

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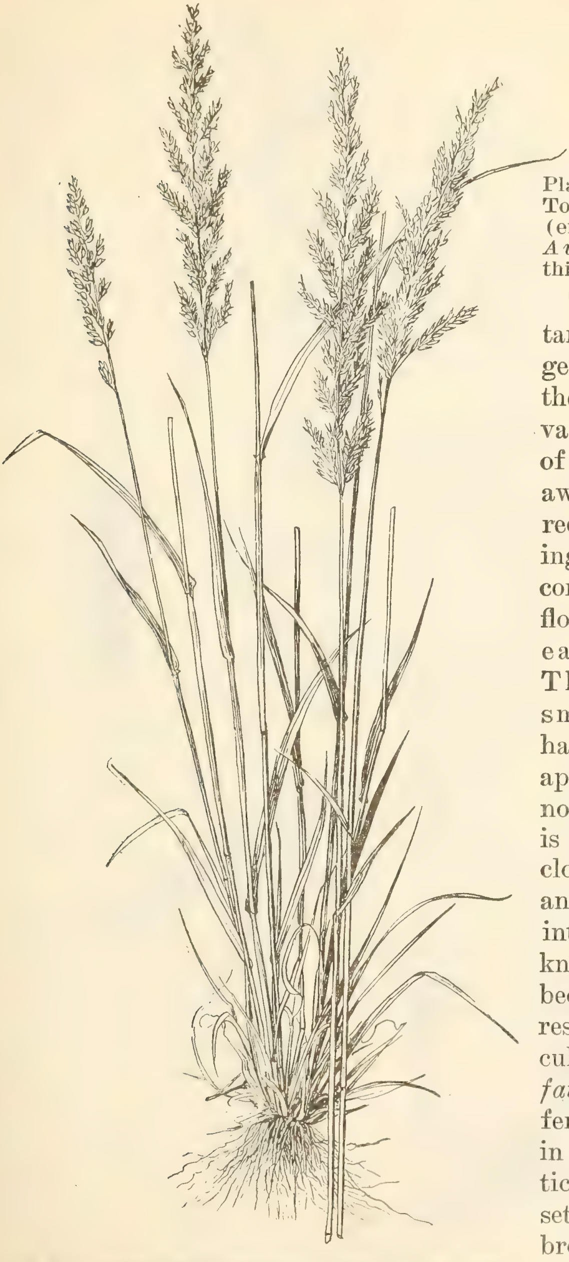
[1] Gen. Pl. 99. 1837.

[2] Hitchcock, Contr. U. S. Nat. Herb. **15**: 87. 1910.

Stipa, *A. elatior* to Arrhenatherum, *A. pennsylvanica* to Trisetum, *A. flavescens* to Trisetum, *A. fragilis* to Gaudinia, *A. spicata* to Danthonia. In the Genera Plantarum, Linnæus cites Tournefort's figure 267 (error for 297), which is *Avena sativa*. Hence this is the type species.



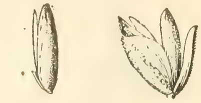


Fig. 57.—*Sphenopholis obtusata.* Plant, × ½; spikelet and floret, × 5.

The most important species of the genus is *Avena sativa*, the familiar cultivated oat. In many of the varieties the awn is straight, often reduced, or even wanting. The spikelets contain usually two florets that do not easily disarticulate. The lemmas are smooth or slightly hairy at the base, the apical teeth acute but not awned. The grain is permanently inclosed in the lemma and palea. Two other introduced species are known as wild oats, because of their close resemblance to the cultivated oat. *Avena fatua* L. (fig. 58) differs from *A. sativa* in the readily disarticulating florets, beset with stiff, usually brown hairs, and in the well-developed geniculate and twisted awn. A variety of this (*A. fatua glabrata* Peterm.) has glabrous florets. In our other species of wild oats, *A. barbata* Brot., the pedicels are more slender, the spikelets pendulous, and the teeth of the lemma are prolonged into delicate awns. These species of wild oats are common on the Pacific coast, where they are weeds, but are

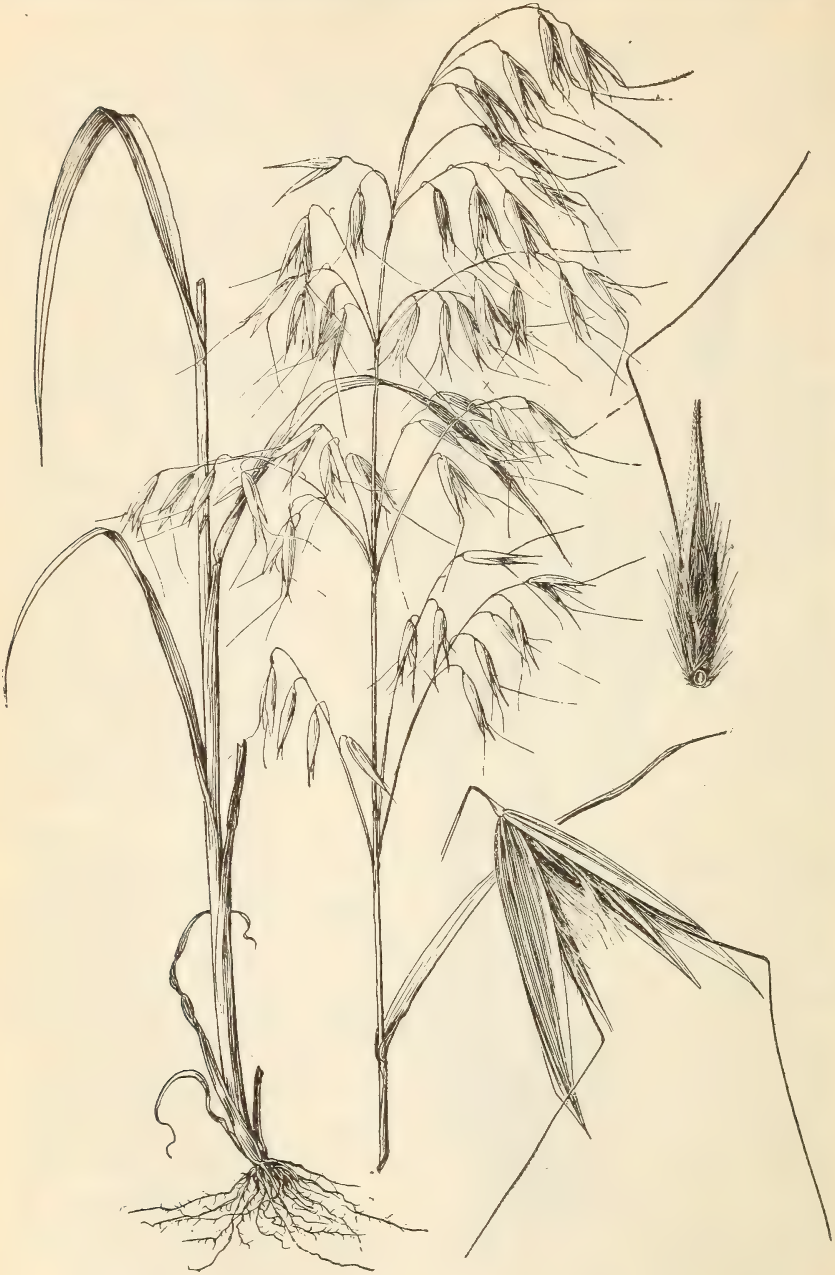


FIG. 58.—Wild oats, *Avena fatua*. Plant, × ½; spikelet and floret, × 2.

utilized for hay. Much of the grain hay of that region is made from either cultivated or wild oats.

The varieties of cultivated oat are derived from three species of Avena. The common varieties of this country and of temperate and mountain regions in general are derived from *A. fatua.* The Algerian oat grown in North Africa and Italy and the red oat of our Southern States are derived from *A. sterilis.* A few varieties adapted to dry countries are derived from *A. barbata*[1].

Avena sterilis L., animated oats, is sometimes cultivated as a curiosity. When laid on the hand or other moist surface the fruits twist and untwist as they lose or absorb moisture.

Our two native species, found in the Rocky Mountain region, are perennials, with narrow few-flowered panicles of erect spikelets smaller than those of *Avena sativa.* They are excellent forage grasses, but occur only scatteredly.

48. ARRHENATHERUM Beauv.

Spikelets 2-flowered, the lower floret staminate, the upper perfect, the rachilla disarticulating above the glumes, produced beyond the florets as a slender bristle; glumes rather broad and papery, the first 1-nerved, the second a little longer than the first and about as long as the spikelet, 3-nerved; lemmas 5-nerved, hairy on the callus, the lower bearing near the base a twisted, geniculate, exserted awn, the upper bearing a short, straight, slender awn just below the tip.

Perennial, rather tall grasses, with flat blades and rather dense panicles. Species about six, in the temperate regions of Eurasia; one species introduced into the United States.

Type species: *Arrhenatherum avenaceum* Beauv.

Arrhenatherum Beauv., Ess. Agrost. 55, pl. 11, f. 5. 1812. Beauvois figures one species, which he calls *Arrhenatherum avenaceum.* This is *Avena elatior* L., and is now called *Arrhenatherum elatius* (L.) Mert. and Koch.

Arrhenatherum elatius (Pl. XII; fig. 59) is occasionally cultivated in the humid regions of the United States as a meadow grass under the name of tall oat-grass. It is a fairly satisfactory forage grass, but the seed is expensive and often of poor quality. This species is often found growing spontaneously in grassland and along roadsides in the Northern States.

A variety, *Arrhenatherum elatius bulbosum* (Presl) Koch, has appeared recently in some of the Atlantic States. It differs from the ordinary form in having at the base of the stem a moniliform string of 2 to 5 small corms 5 to 10 mm. in diameter.

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[1] See Journ. Hered, 5: 56, 1914, a translation of an article by Trabut. Also see Norton, Amer. Breed. Assoc. 3: 281. 1907.

49. AIRA L.

(*Deschampsia* Beauv.)

Spikelets 2-flowered, disarticulating above the glumes, the hairy rachilla prolonged behind the upper floret as a stipe, this sometimes bearing a reduced floret; glumes about equal, acute or acutish, membranaceous; lemmas thin, truncate and 2 to 4 toothed at the summit, bearing a slender awn from or below the middle, the awn straight, bent, or twisted.

Low or moderately tall annual or usually perennial grasses, with shining pale or purplish spikelets in narrow or open panicles. Species about 35, in the temperate and cool regions of both hemispheres, 6 of these being in the United States.

Type species: *Aira caespitosa* L.

Aira L., Sp. Pl. 63, 1753; Gen. Pl., ed. 5, 31. 1754. Fourteen species are described. The name was first used for a genus by Linnæus in his Flora Lapponica in 1737, where he describes four species. These four species are named in the Species Plantarum: 7. *A. spicata*, 8. *A. caespitosa*, 9. *A. flexuosa*, 10. *A. montana*. The first of these, *A. spicata*, is referred to Trisetum; the other three belong to Deschampsia, as recognized in most American botanies. The genus Aira, as accepted by Bentham and Hooker in the Genera Plantarum and by Hackel in the Natürlichen Pflanzenfamilien, is based upon the last two of the original Linnæan

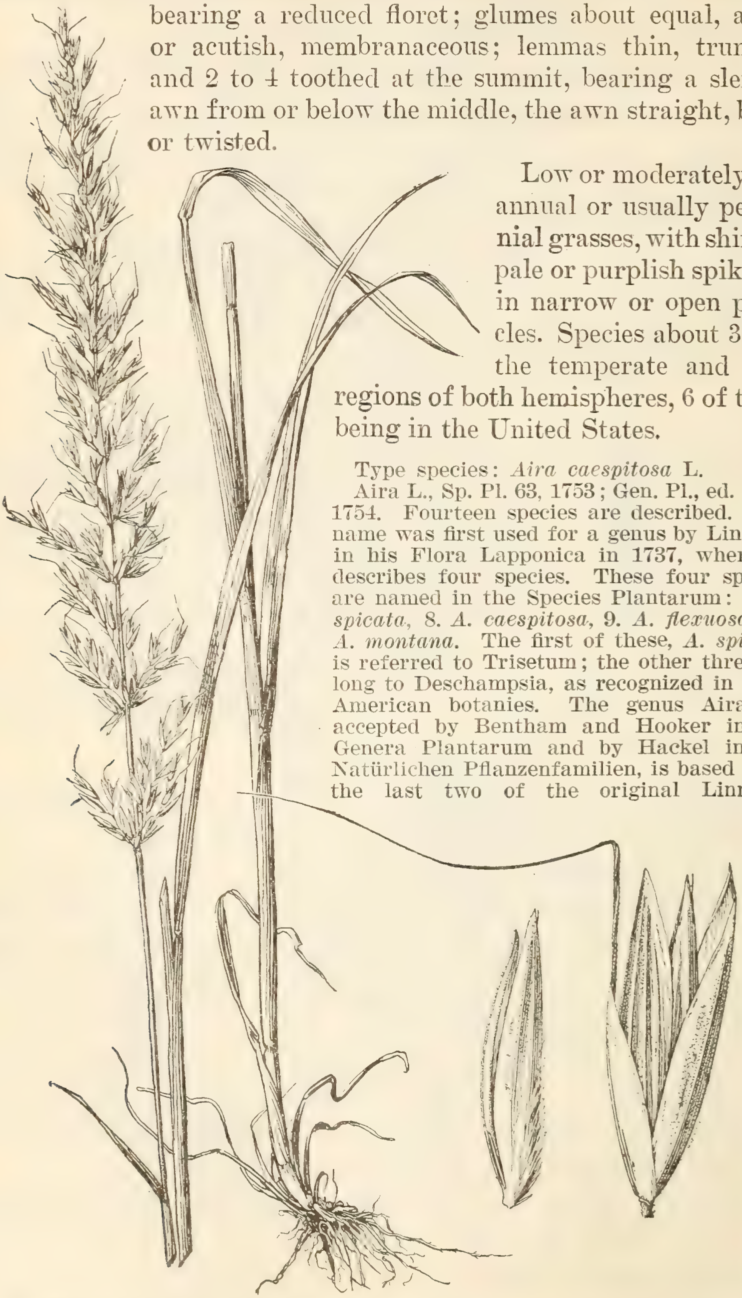

FIG. 59.—Tall oat-grass, *Arrhenatherum elatius*. Plant, × ½; spikelet and fertile floret, × 5.

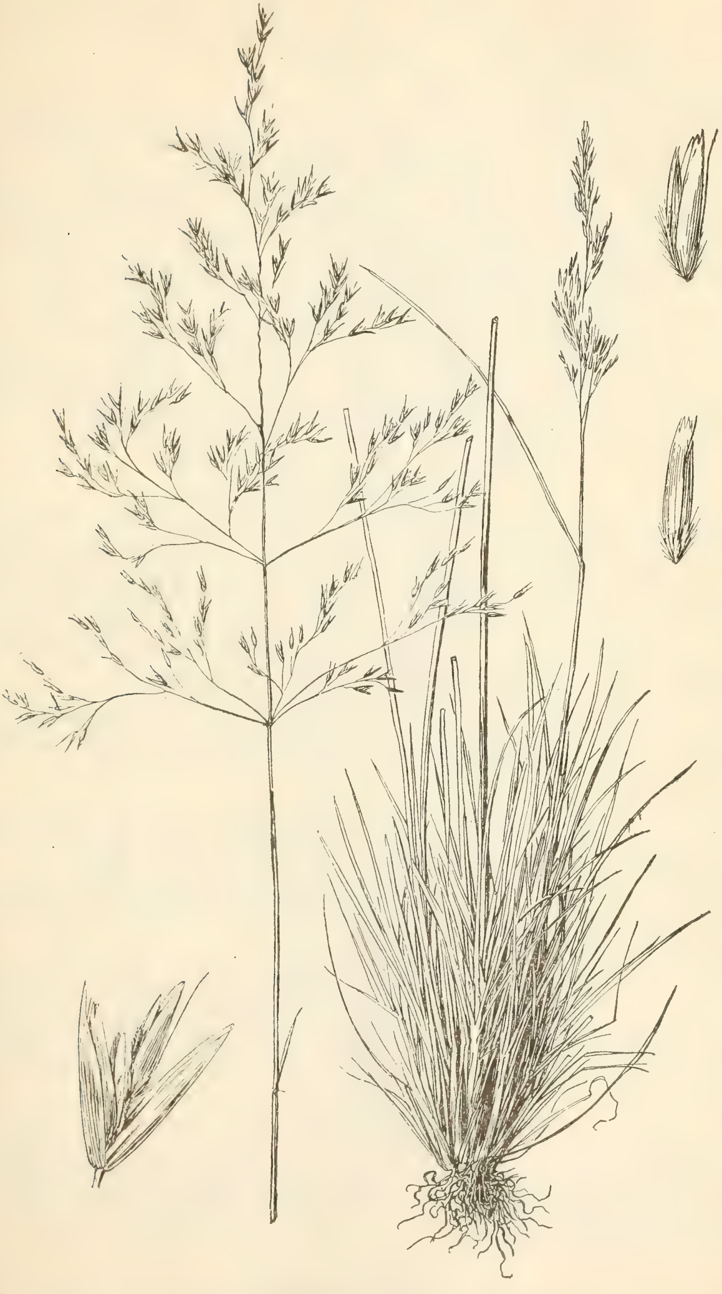

FIG. 60.—Tufted hair-grass, *Aira caespitosa.* Plant, × ½; spikelet and two views of floret, × 5.

species. *A. praecox* and *A. caryophyllea*, which are found in southern Europe and are not described by Linnæus in his Flora Lapponica nor in his Flora Suecica. Linnæus's generic idea of Aira is evidently represented by the four species first included in the genus. From these *Aira caespitosa* is arbitrarily selected as the type.

Deschampsia Beauv., Ess. Agrost. 91, pl. 18, f. 3. 1812. The figured species, the type, is *D. caespitosa.*

Lerchenfeldia Schur., Enum. Pl. Transs. 753. 1866. Three species are included. *Aira flexuosa* L., on which *L. flexuosa* is based, is taken as the type.

Aira danthonioides Trin. of the Pacific coast is an annual. *Aira caespitosa* L. (*Deschampsia caespitosa* Beauv.) (fig. 60) is common in moist or wet soil from Newfoundland to Alaska and south to New Jersey, Illinois, and, in the western mountains, to New Mexico and southern California. It is a tufted perennial 1 to 4 feet high, with smooth, narrow, folded blades and open drooping panicles, 4 to 12 inches long, of shining pale-bronze or purplish spikelets. This species, sometimes called tufted hair-grass, is often the dominant grass in mountain meadows, where it furnishes excellent forage.

50. ASPRIS Adans.

(*Aira* of authors.)

Spikelets 2-flowered, the rachilla disarticulating above the glumes, not prolonged; glumes about equal, acute, membranaceous or subscarious; lemmas firm, rounded on the back, tapering into two slender teeth, the callus with a very short tuft of hairs, bearing on the back below the middle a slender, geniculate, twisted, usually exserted awn, this reduced or wanting in the lower floret in one species.

Low, delicate annuals with small open or contracted panicles. Species about nine, in southern Europe, three being introduced in the United States.

Type species: *Aira praecox* L.

Aspris Adans., Fam. Pl. **2**: 496, 522. 1763. The references cited are also cited by Linnæus under *Aira praecox.*

Caryophyllea Opiz, Seznam 27. 1852. Based on *Aira caryophyllea.*

Fussia Schur., Enum. Pl. Transs. 754. 1866. Three species, *F. praecox*, *F. caryophyllea*, and *F. capillaris*, are included. *Aira praecox*, upon which the first species is based, is taken as the type.

Our three species are *Aspris caryophyllea* (L.) Nash (fig. 61), *A. praecox* (L.) Nash, and *A. capillaris* (Host) Hitchc. (*Aira capillaris* Host). They are found frequently on the Pacific coast and occasionally in the Eastern States. The species are of no economic importance.

Weingaertneria canescens Bernh. has been found upon ballast at Philadelphia and on Marthas Vineyard. This is a low, tufted annual with pale, contracted panicles, differing from the species of Aspris in having club-shaped awns.

51. NOTHOLCUS Nash.

(*Holcus* of authors.)

Spikelets 2-flowered, the pedicel disarticulating below the glumes, the rachilla curved and somewhat elongate below the first floret, not prolonged above the second floret: glumes about equal, longer than the two florets; first floret perfect, its lemma awnless; second floret staminate, its lemma awned on the back.

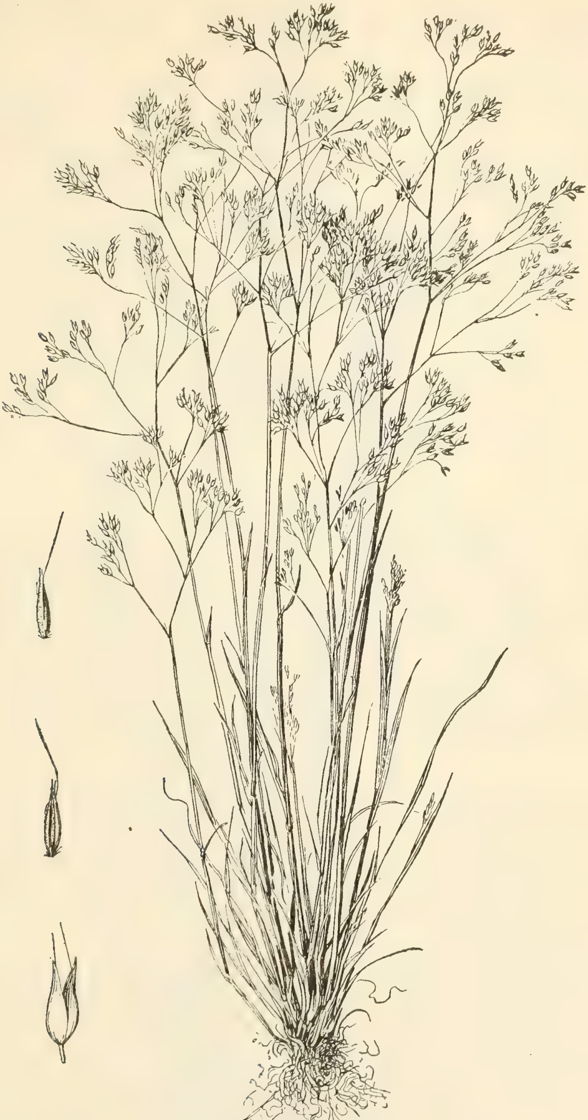

FIG. 61.—*Aspris caryophyllea.* Plant, × ½; spikelet and two views of floret, × 5.

Perennial grasses, with flat blades and contracted panicles. Species about eight, Europe and Africa; two introduced into the United States.

Type species: *Holcus lanatus* L.

Ginannia Bubani, Fl. Pyren. 4: 321, 1901, not Scop., 1777, nor Dietr., 1804. Based on "Holcus L. et Auctor.," the two species included, *G. pubescens* and *G. mollis*, showing that it is to the species congeneric with *Holcus lanatus* L. that the name is applied.

Notholcus Nash; Hitch., in Jepson, Fl. Calif. **3:** 126. 1912. Only one species described. Notholcus is derived from the Greek nothos, false, and Holcus, the generic name formerly applied to this group. Nash[1] spells the name Notholcus. For a discussion of the reasons for the change of name, see page 266. The generic name Holcus is there applied to the sorghums, necessitating a new name for the velvet grass.

The common species in the United States is *Notholcus lanatus* (L.) Nash (*Holcus lanatus* L.), known as velvet grass (fig. 62). This species is introduced in various places in the Eastern States and also on the Pacific coast, where it is abundant. It is an erect, grayish, velvety-pubescent grass 2 to 3 feet tall, with a contracted pale or purplish panicle 2 to 4 inches long. Velvet grass is sometimes recommended as a meadow grass, but for this purpose it has little value except on moist sandy or sterile soil where other grasses will not thrive. It has been used with some success in sandy fields around the mouth of the Columbia River in Washington and Oregon.

A second species, *Notholcus mollis* (L.) Hitchc., with creeping rhizomes, has been introduced in California, where it is rare.

52. DANTHONIA Lam. and DC.

Spikelets several-flowered, the rachilla readily disarticulating above the glumes and between the florets; glumes about equal, broad and papery, acute, mostly exceeding the uppermost floret; lemmas rounded on the back, obscurely several-nerved, the base with a strong callus, the apex bifid, the lobes acute, usually extending into slender awns, a stout awn arising from between the lobes; awn flat, tightly twisted below, geniculate, exserted, including three nerves of the lemma.

Tufted, low or moderately tall perennials, with few-flowered, open, or spikelike panicles of rather large spikelets. Species about 100, in the temperate regions of both hemispheres; especially abundant in South Africa; 12 species in the United States, about equally divided between the Eastern and the Western States.

Type species: *Avena spicata* L.

Danthonia Lam. and DC., Fl. Franc. **3:** 32. 1805. The work cited is a local flora in which the two French species are described, *D. decumbens* (which is the same as *Sieglingia decumbens*) and *D. provincialis*. The authors, however, mention in the paragraph preceding the one devoted to the generic description that "besides the species described below one ought to refer to this genus, 1st, *Avena spicata* L. or *Avena glumosa* Michx.; 2d. *Avena calicina* Lam. not Vill." Of the four species mentioned, three are congeneric with *Avena spicata* and correspond with the generic description better than does *Danthonia decumbens*, which is the first species described under Danthonia. *Avena spicata* is selected as the type of Danthonia.[2] Piper[3] has selected *Festuca decumbens* L. (*Danthonia decumbens*) as the type of Danthonia because it is the first species described under Danthonia, and takes up Merathrepta Raf. for the species generally referred to Danthonia. Nelson and Macbride[4] take up Pentameris Beauv. in place of Merathrepta.

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[1] Britt. and Brown, Illustr. Fl., ed. 2, **1:** 214. 1913.

[2] See Hitchc., Bot. Gaz. **57:** 328. 1914.

[3] Contr. U. S. Nat. Herb. **11:** 122. 1906.

[4] Bot. Gaz. **56:** 469. 1913.

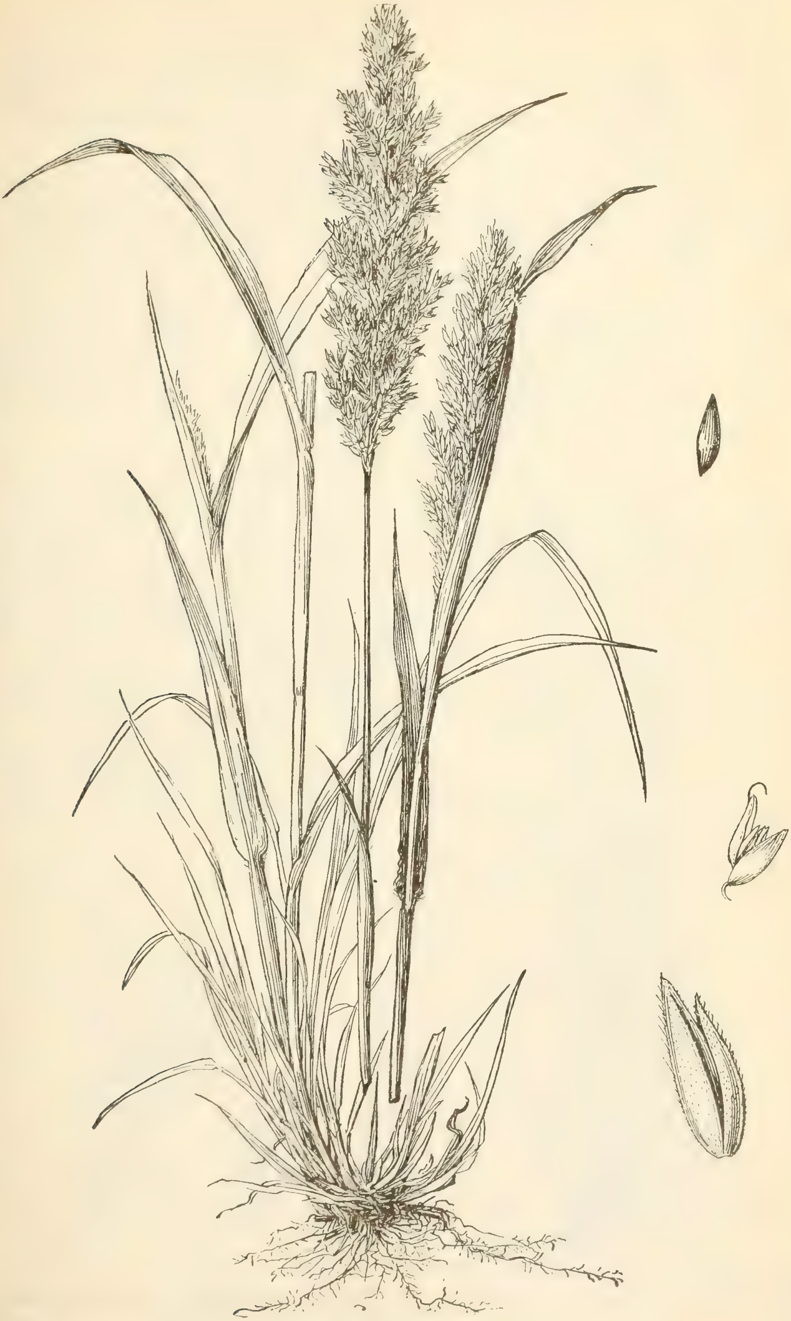
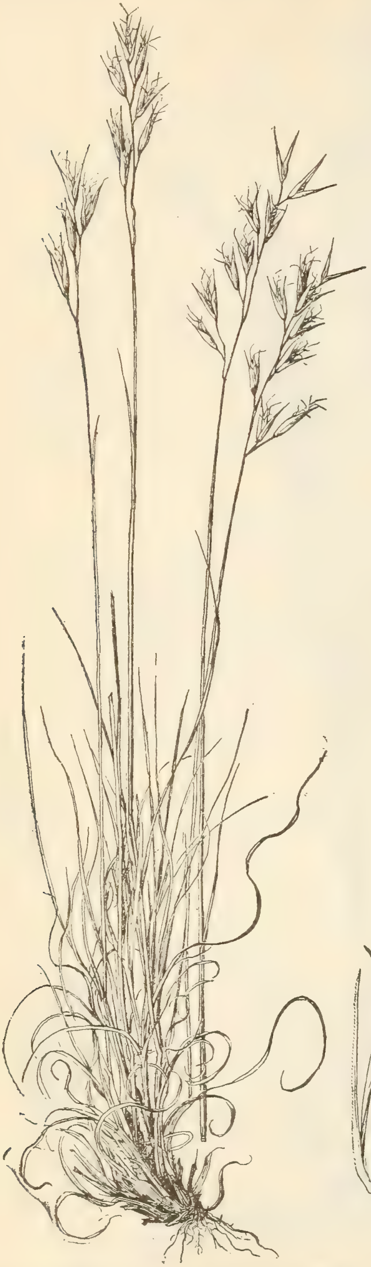


Fig. 62.—Velvet grass, *Notholcus lanatus.* Plant, × ½; spikelet, florets with glumes removed, and mature fertile floret, all × 5.

Pentameris Beauv., Ess. Agrost. 92, pl. 18, f. 8. 1812. *P. thuarii* is the type, as this is the single species mentioned and figured. This is a South African species and represents a group in which the lateral teeth of the lemmas are 2-awned. The group is considered to be generically distinct from Danthonia by Stapf.[1] The name is taken up by Nelson and Macbride in place of Merathrepta Raf.[2]

Merathrepta Raf., Bull. Bot. Seringe **1**: 221. 1830. The genus is described briefly and *Avena spicata* mentioned. This species is, therefore, the type.

One species of Danthonia, *D. spicata* (L.) Beauv. (fig. 63), is common on sterile hills and in dry, open woods in the Eastern States, where it is sometimes called poverty grass. It can be recognized, even when not in flower, by its small tufts of curly leaves. In the Western States the species are found in grassland and contribute somewhat toward the forage value of the range, but usually they are not abundant. All our species produce cleistogenes (enlarged fertile cleistogamous spikelets) in the lower sheaths,[3] and the culms finally disarticulate at the nodes below these.



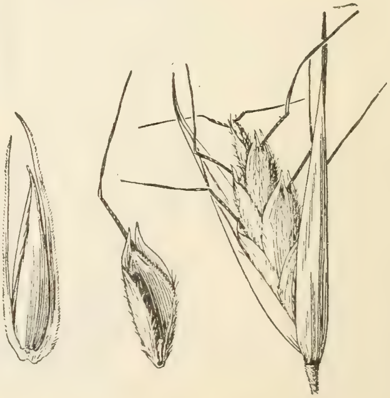


Fig. 63.—Wild oat-grass, *Danthonia spicata*. Plant, × ½; spikelet, floret, and a cleistogene from the axil of a lower leaf, all × 5.

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[1] Thiselt. Dyer, Fl. Cap. **7**: 512. 1898.

[2] See following paragraph on Merathrepta.

[3] Chase, Amer. Journ. Bot. **5**: 254. 1918.

5. AGROSTIDEAE, THE TIMOTHY TRIBE.

53. CALAMAGROSTIS Adans.

Spikelets 1-flowered, the rachilla disarticulating above the glumes, usually prolonged behind the palea as a short, commonly hairy bristle; glumes about equal, acute or acuminate; lemma shorter and usually more delicate than the glumes, the callus bearing a tuft of hairs, which are often copious and as long as the lemma, awned from the back, usually below the middle, the awn being delicate and straight, or stouter and exserted, bent and sometimes twisted; palea shorter than the lemma.

Perennial, usually moderately tall or robust grasses, with small spikelets in open or usually narrow, sometimes spikelike panicles. Species over 100, in the cool and temperate regions of both hemispheres; 26 species in the United States, mostly in the western mountains.

Type species: *Arundo calamagrostis* L.

Calamagrostis Adans., Fam. Pl. **2**: 31, 530. 1763. Adanson describes no species but in the index there is given under Kalamagrostis Diosk., three names or citiations, Negil. Arab., Gramen. Sheuz. t. 3. f. 5., and Arundo Lin. The reference to Scheuchzer is found in Linnæus's Species Plantarum under *Arundo calamagrostis* (**1**: 82), which consequently is the type of Calamagrostis.

Deyeuxia Clarion; Beauv., Ess. Agrost. 43, pl. 9, f. 9, 10. 1812. Type, *D. montana*, the first of the two species figured.

Amagris Raf., Princip. Fondament. Somiologie 27. 1814. A new name proposed for Calamagrostis, because that is formed of two other names.

Athernotus Dulac, Fl. Hautes Pyr. 74. 1867. Based on "Calamagrostis Ad." Lunell[1] uses this name for Calamovilfa, but Dulac bases the genus on Calamagrostis Adans., and the three species he includes belong in Calamagrostis, not in Calamovilfa.

By some authors the species with prolonged rachilla are segregated as a distinct genus, Deyeuxia, the name Calamagrostis being retained for those species in which the rachilla is not prolonged. The American species all belong to the section Deyeuxia.

Four Pacific coast species have loose, open panicles. In all the other species the panicle is rather compact, in some cases spikelike. The commonest species in the United States is *Calamagrostis canadensis* (Michx.) Beauv. (fig. 64), growing in swamps and low ground from New England to Oregon, and southward in the mountains and northward to the arctic circle. It is an important source of wild hay from Wisconsin to North Dakota, but is of only medium value for grazing. Much of the marsh hay of Wisconsin and Minnesota belongs to this species, which in that region is called bluejoint. This is the dominant grass in the interior of Alaska. The species is distinguished by having flat blades, a somewhat lax, usually nodding panicle, the hairs at the base of the floret copious and as long as the lemma, the awn straight, delicate, not exserted beyond the glumes, the latter 3 to 5 mm. long.

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[1] Amer. Midl. Nat. **4**: 218. 1915.

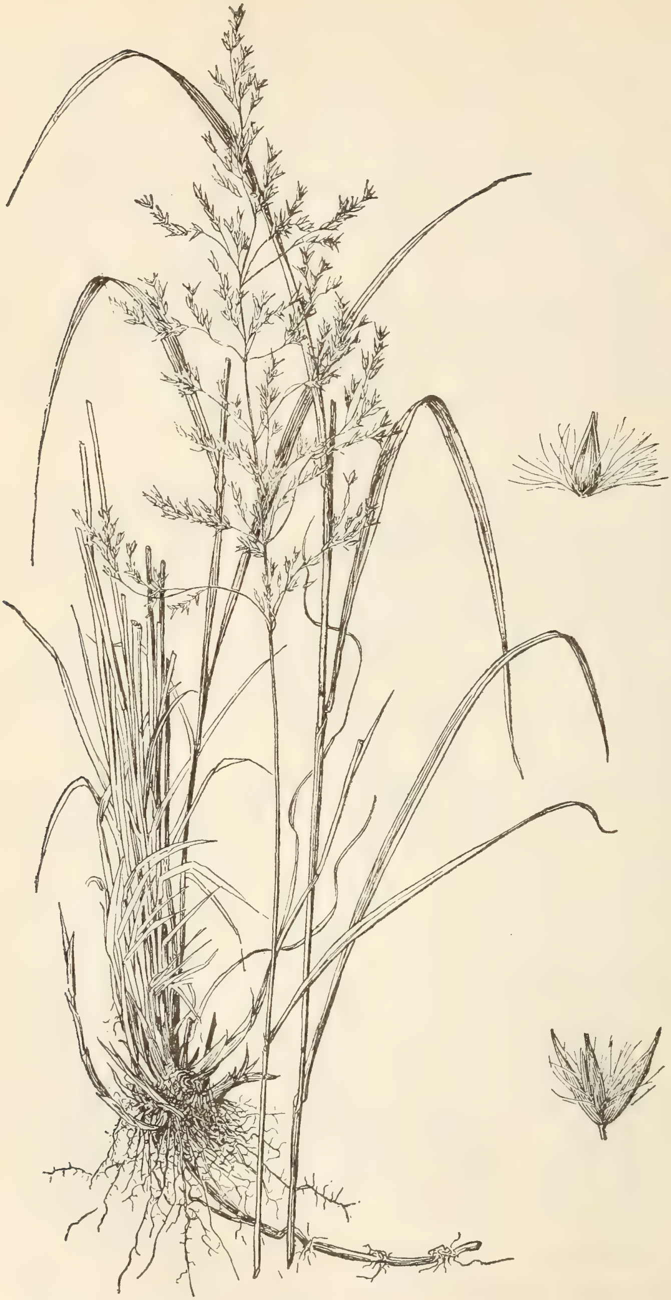

FIG. 64.—Bluejoint, *Calamagrostis canadensis.* Plant, × ½; spikelet and floret, × 5.

Calamagrostis scabra Presl, closely allied to the above, but with somewhat larger spikelets, is abundant along the coast from Oregon to Alaska. This has been incorrectly referred to *C. langsdorfii* (Trin.) Link, of Siberia. In general, the species of Calamagrostis are important forage grasses. Pine-grass (*C. rubescens* Buckl.) is common in the mountains of Oregon and Washington, where it forms an important part of the forage.

For a revision of the species of Calamagrostis found in the United States, see Kearney, U. S. Dept. Agr., Div. Agrost. Bull. 11. 1898.

54. AMMOPHILA Host.

Spikelets 1-flowered, compressed, the rachilla disarticulating above the glumes, produced beyond the palea as a short bristle, hairy above; glumes about equal, chartaceous; lemma similar to and a little shorter than the glumes, the callus bearing a tuft of short hairs; palea nearly as long as the lemma.

A tough, rather coarse, erect perennial, with hard, scaly, creeping rhizomes, long, tough, involute blades, and a pale, dense, spikelike panicle. One species is found on the sandy seacoast of Europe and northern North America as far south as North Carolina and on the shores of the Great Lakes, a second species around the Baltic.

Type species: *Arundo arenaria* L.

Ammophila Host, Gram. Austr. **4**: 24, pl. 41. 1809. Only one species described, *A. arundinacea* Host, based on *Arundo arenaria* L.

Psamma Beauv., Ess. Agrost. 143, pl. 6, f. 1. 1812. The one species, *P. littoralis*, is *Ammophila arenaria*.

Ammophila arenaria (L.) Link (fig. 65) is an important sand-binding grass in Europe, being used there to hold the barrier dunes along the coast. In this country it has been tried with success on Cape Cod and at Golden Gate Park, San Francisco.[1] It is called beach-grass and less frequently marram grass and sea marram.

55. CALAMOVILFA Hack.

Spikelets 1-flowered, the rachilla disarticulating above the glumes, not prolonged behind the palea; glumes unequal, acute, chartaceous; lemma a little longer than the second glume, chartaceous, awnless, glabrous or pubescent, the callus bearded; palea about as long as the lemma.

Perennial, rigid, usually tall grasses, with narrow or open panicles, some species with creeping rhizomes. Species four, confined to the United States and southern Canada.

Type species: *Calamagrostis brevipilis* Gray.

Calamovilfa Hack., True Grasses 113. 1890. The True Grasses is a translation by Scribner and Southworth of the article on grasses in Engler and Prantl's Natürlichen Pflanzenfamilien. Scribner has added bracketed notes. In a para-

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[1] For a full discussion, see Hitchcock, U. S. Dept. Agr., Bur. Pl. Ind. Bull. 57; Westgate, U. S. Dept. Agr., Bur. Pl. Ind. Bull. 65. 1904.

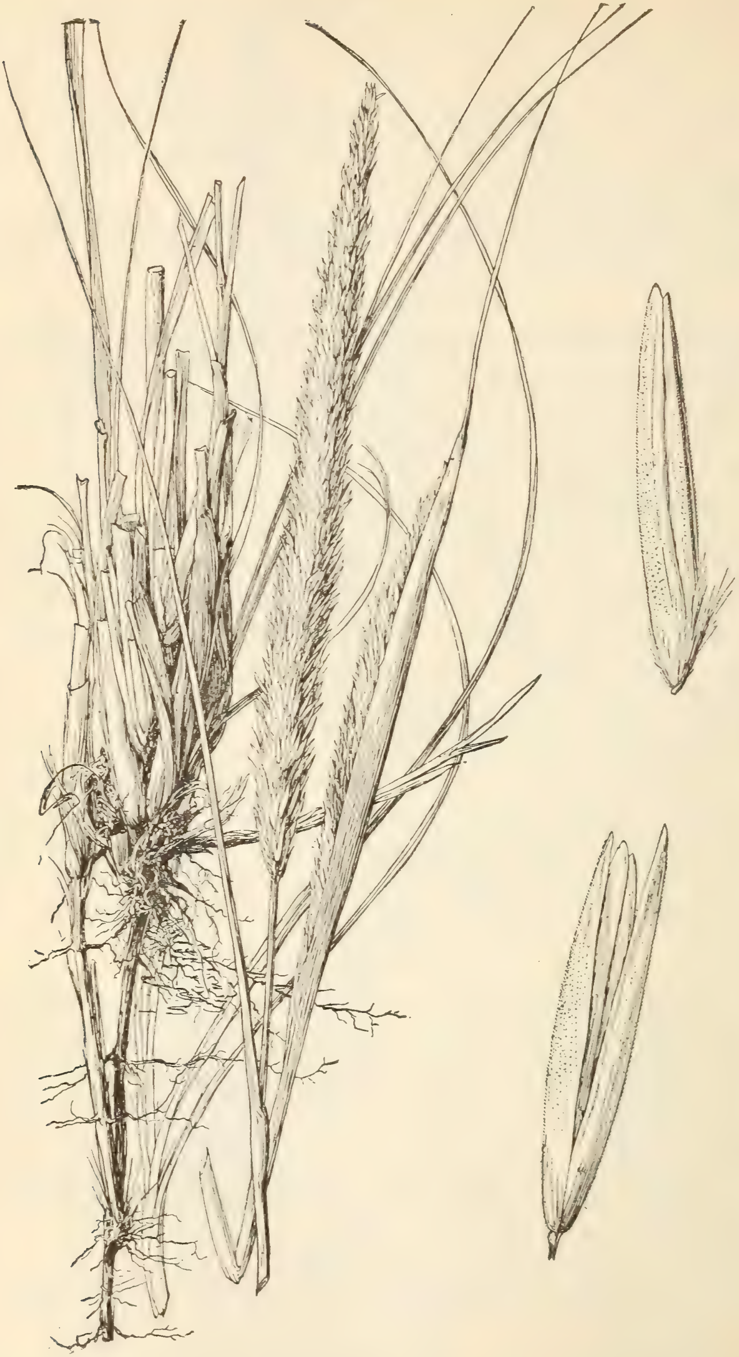

FIG. 65.—Beach-grass, *Ammophila arenaria.* Plant, × ½; spikelet and floret, × 5.

graph quoted from Hackel ("Hackel in MS.") is a statement that two species, *Calamagrostis brevipilis* Gray and *C. longifolia* Hook., may best be considered a separate genus, Calamovilfa. Scribner adds a note formally describing the genus Calamovilfa and mentions the two species, *Calamovilfa brevipilis* and *C. longifolia*. The first is selected as the type.

The genus differs from Calamagrostis in the chartaceous lemma, from our species of Calamagrostis in the absence of a prolonged rachilla, and from Ammophila in the more open panicles and in the absence of the prolongation of the rachilla.

The four species are *Calamovilfa brevipilis* (Torr.) Scribn., in the pine barrens from New Jersey to North Carolina; *C. curtissii* (Vasey) Scribn., confined to Florida; *C. longifolia* (Hook.) Scribn. (fig. 66), of the Great Plains and the dune region of Lake Michigan; *C. gigantea* (Nutt.) Scribn. and Merr., also of the Great Plains. The first two species are without creeping rhizomes; the other two have numerous stout rhizomes and are excellent sand binders. *Calamovilfa longifolia* and *C. gigantea* are closely related. They are differentiated by the less expanded panicle and glabrous florets of the first and the spreading panicle, larger spikelets, and villous florets of the second.

Calamovilfa longifolia, the commonest species, is of some value for forage, but is rather coarse and woody.

56. AGROSTIS L., the bent-grasses.

Spikelets 1-flowered, disarticulating above the glumes, the rachilla usually not prolonged; glumes equal or nearly so, acute, acuminate, or sometimes awn-pointed, carinate, usually scabrous on the keel and sometimes on the back; lemma obtuse, usually shorter and thinner in texture than the glumes, awnless or dorsally awned, often hairy on the callus; palea usually shorter than the lemma, 2-nerved in only a few species, usually small and nerveless or obsolete.

Annual or usually perennial, delicate or moderately tall grasses, with glabrous culms, flat or sometimes involute, scabrous blades, and open or contracted panicles of small spikelets. Species about 100, in the temperate and cold regions of the world, especially in the Northern Hemisphere. About 25 species are found in the United States, some of these being found also in Europe.

Type species: *Agrostis stolonifera* L.

Agrostis L., Sp. Pl. 61, 1753; Gen. Pl., ed. 5, 30. 1754. Linnæus describes 12 species, dividing them into two groups, Aristatae and Muticae. The description of the genus refers to the lemma as being awned and to the presence of a palea ("Cor. bivalvis . . . altera majore aristata"). If the type species must agree with the description in the fifth edition of the Genera Plantarum,[1] it must be chosen from the first group, Aristatae, and from those

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[1] See American Code of Botanical Nomenclature, Bull. Torrey Club 34: 174. 1907. The statement is made that "the genera of Linnæus's Species Plantarum (1753) are to be typified through the citations given in his Genera Plantarum (1754)." There is no citation given for Agrostis and the code does not definitely require that the genera must be interpreted by the descriptions here given; hence the type species may be chosen independent of this description.

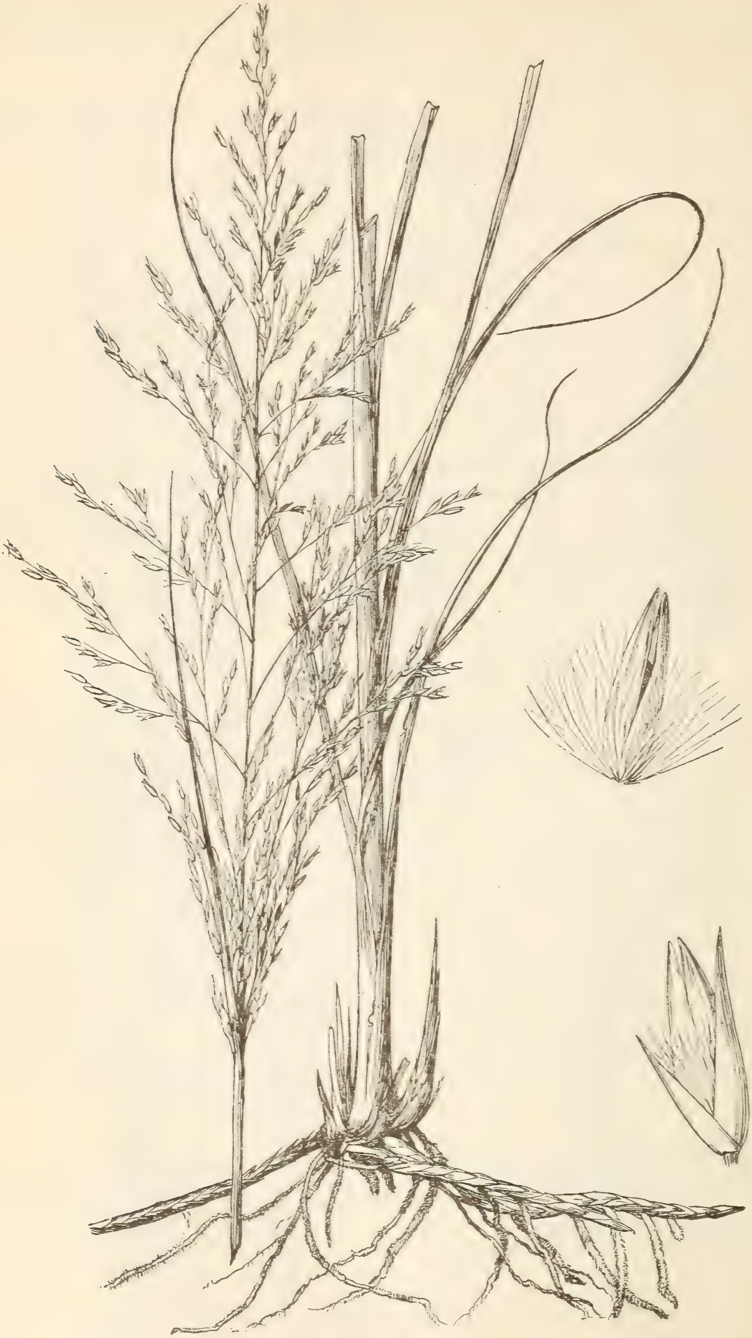

FIG. 66.—*Calamovilfa longifolia.* Plant, × ½; spikelet and floret, × 5.

species possessing a palea. From this standpoint the type species would be *Agrostis spica-venti*, which is referred by many botanists to Apera but which is here included in Agrostis. However, the description of Agrostis in the fifth edition was not written by Linnæus for that edition. It was copied from the first edition, published in 1737, at which time Linnæus's concept of Agrostis was chiefly based on *Stipa calamagrostis*. By the time the Species Plantarum was prepared his concept of the genus Agrostis had changed, but he did not make the corresponding change in the description in the fifth edition of the Genera Plantarum which he prepared at the same time. It seems best, then, to ignore this description and select the type species from the economic species. Therefore *A. stolonifera*[1] has been selected as the type species of Agrostis. Several of the original species are now referred to other genera: *A. miliacea* and *A. paradoxa* to Oryzopsis; *A. arundinacea* to Calamagrostis; *A. minima* to Mibora; *A. virginica* and *A. indica* to Sporobolus.

Vilfa Adans., Fam. Pl. **2**: 495. 1763. Adanson cites "Gramen canin. supin. C. B. Theat. 12" and in the index, "Gramen canin. supin. minus C. B." Linnæus[2] gives under *Agrostis stolonifera* the citation, "Gramen caninum supinum minus Scheuch. gram. 128." Scheuchzer[3] credits the citation to C. Bauhin. Therefore *Agrostis stolonifera* L. is the type of Vilfa Adans.

Apera Adans., Fam. Pl. **2**: 495. 1763. Adanson refers directly to "Agrostis 1. Lin. Sp. 61." The first species of Agrostis described by Linnæus in his Species Plantarum (p. 61) is *A. spica-venti*, which becomes the type of Apera.

Trichodium Michx., Fl. Bor. Amer. **1**: 41, pl. 8. 1803. Two species are described, *T. laxiflorum* and *T. decumbens*. The first species, illustrated in plate 8, is the type. This is the same as *Afrostis hiemalis*. *Trichodium decumbens* is the same as *A. perennans*. Michaux distinguished the genus from Agrostis by the absence of the palea.

Agraulus Beauv., Ess. Agrost. 5, pl. 4, f. 7. 1812. Two species, based on *Agrostis canina* L. and *A. alpina* Willd., are included, the first being figured and therefore the type.

Anemagrostis Trin., Fund. Agrost. 128. 1820. Two species, based on *Agrostis spica-venti* L. and *A. interrupta* L., are included, the first of which is taken as the type.

Notonema Raf., Neogenyt. 4. 1825. A single species is included, *Agrostis arachnoides* Ell. (*A. elliottiana* Schult.)

Podagrostis Scribn. and Merr., Contr. U. S. Nat. Herb. **13**: 58. 1910. Based upon Agrostis, section Podagrostis Griseb. in Ledeb. Fl. Ross. **4**: 436. 1853. A single species, *Agrostis aequivalvis* Trin., referred here in each case. *A. thurberiana* Hitchc. also belongs to this group, which forms a section of Agrostis.

In *Agrostis spica-venti*, *A. aequivalvis*, and *A. thurberiana* the rachilla is prolonged behind the palea as a minute bristle or stipe, and the lemma and palea are nearly equal and about as long as the glumes. The palea is obsolete in many species (which have been separated by some authors under the generic name of Trichodium), and is much shorter than the lemma in several other species. The awn, when present, may arise from the back of the lemma just above the base (*A. howellii* Scribn.) or from about the middle (*A. exarata microphylla* (Steud.) Hitchc.) or from just below the apex (*A. spica-venti*, *A. elliottiana*). The hairs on the callus are usually minute, but are half as long as the lemma in *A. hallii* Vasey. Three of our species are annuals, *A. spica-venti* L., introduced from Europe; *A. exigua* Thurb., of California; and *A. elliottiana* Schult., of the Southern States.

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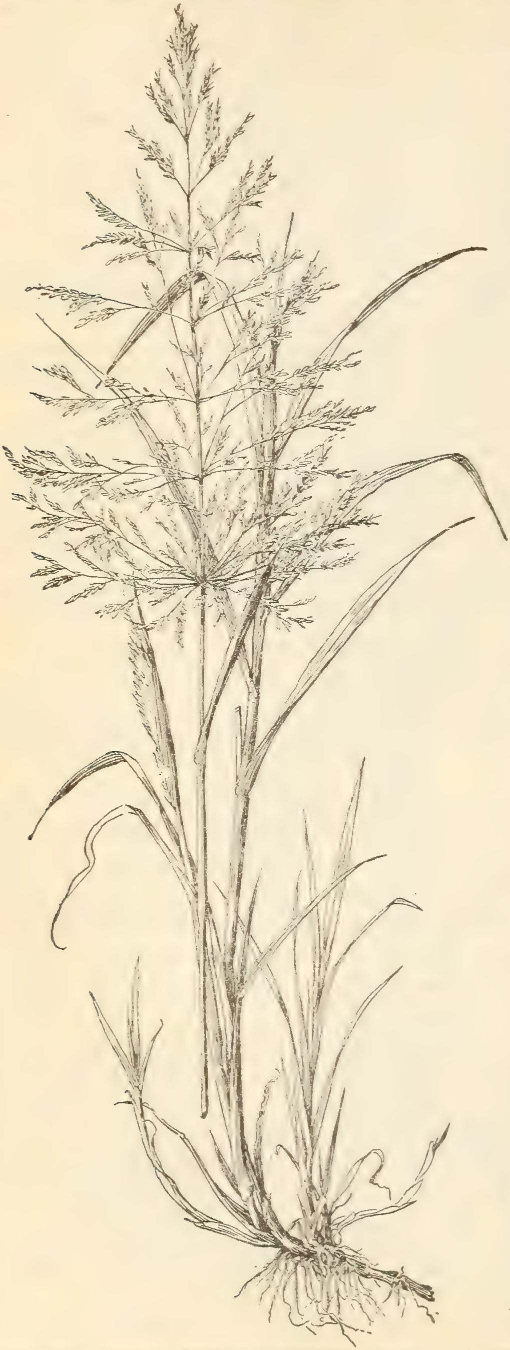
[1] See Hitchcock, Bot. Gaz. 38: 141. 1904. On the basis of the specimen in the Linnæan Herbarium and of the synonymy, the name *A. stolonifera* was there applied to the species called *A. verticillata* Vill. But on reconsideration it seems best to accept the name as applied by Swedish botanists. Linnæus was most familiar with the Swedish grass, and cites as the first synonym under *A. stolonifera* the phrase name he had applied to it in his Flora Suecica. He confused with this the South European species, *A. verticillata*, a specimen of which in his herbarium he marked "*A. stolonifera*," but we may assume that he intended to apply the name *A. stolonifera* to the grass from Sweden. In the latter work Linnæus states that the plant is known popularly as Kryp-hwen. Dr. Carl Lindman, who has kindly sent a series of specimens of the species in question, states in a letter that the grass in Sweden called Krypven (the modern spelling) is the species described by Swedish botanists as *A. stolonifera*. This has a long ligule, an open panicle, and an erect culm decumbent at base or producing stolons.

[2] Sp. Pl. 62. 1753.

[3] Agrost. 128. 1719.

The genus furnishes several species that are important forage plants either under cultivation or in the mountain meadows of the Western States. The most important is *Agrostis palustris* Huds. (*A. alba* of authors[1]) (Pl. XIII; fig. 67), known usually as redtop because of the reddish



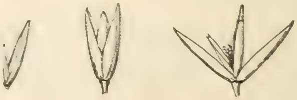


FIG. 67.—Redtop, *Agrostis palustris*. Plant, × ½; spikelet, open and closed, and floret, × 5.

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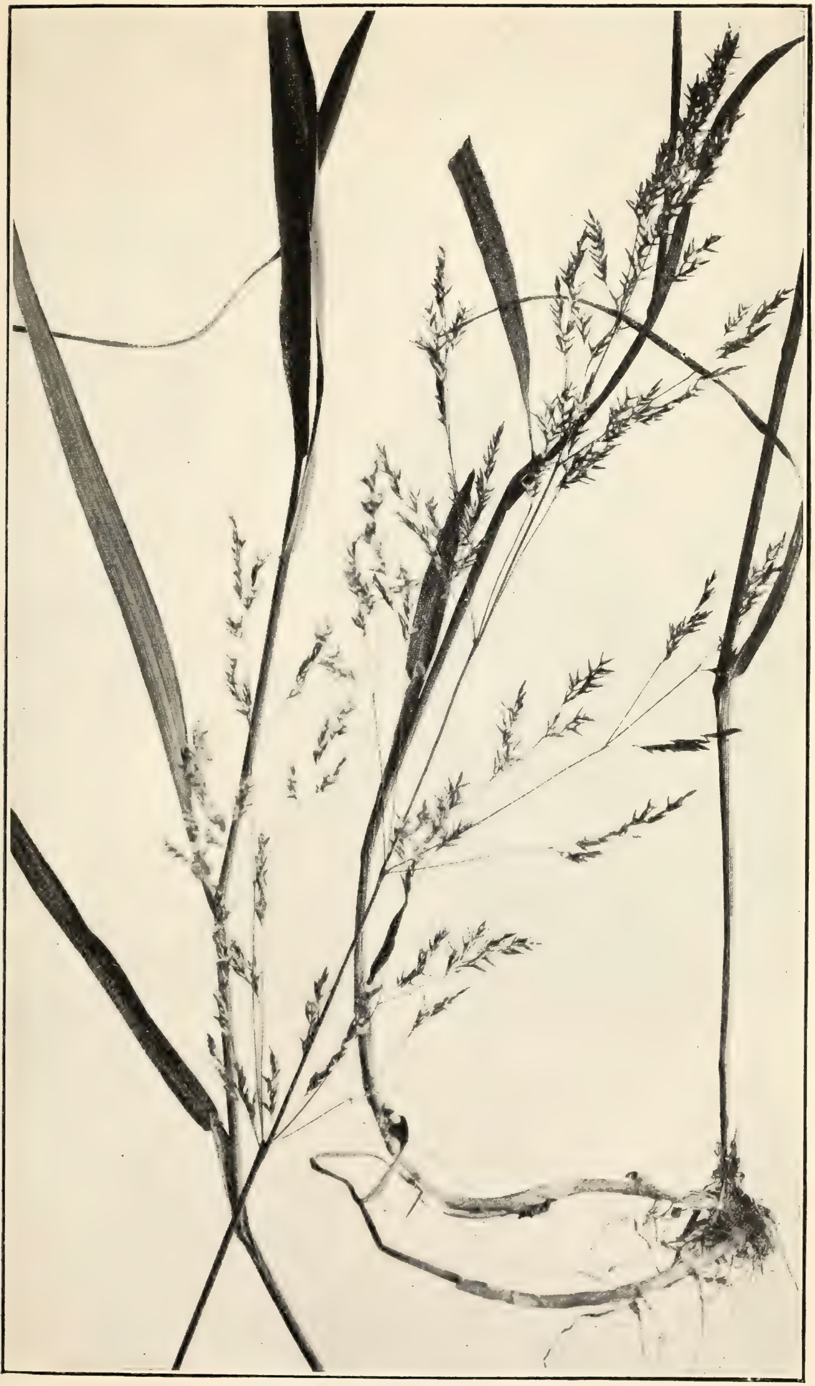
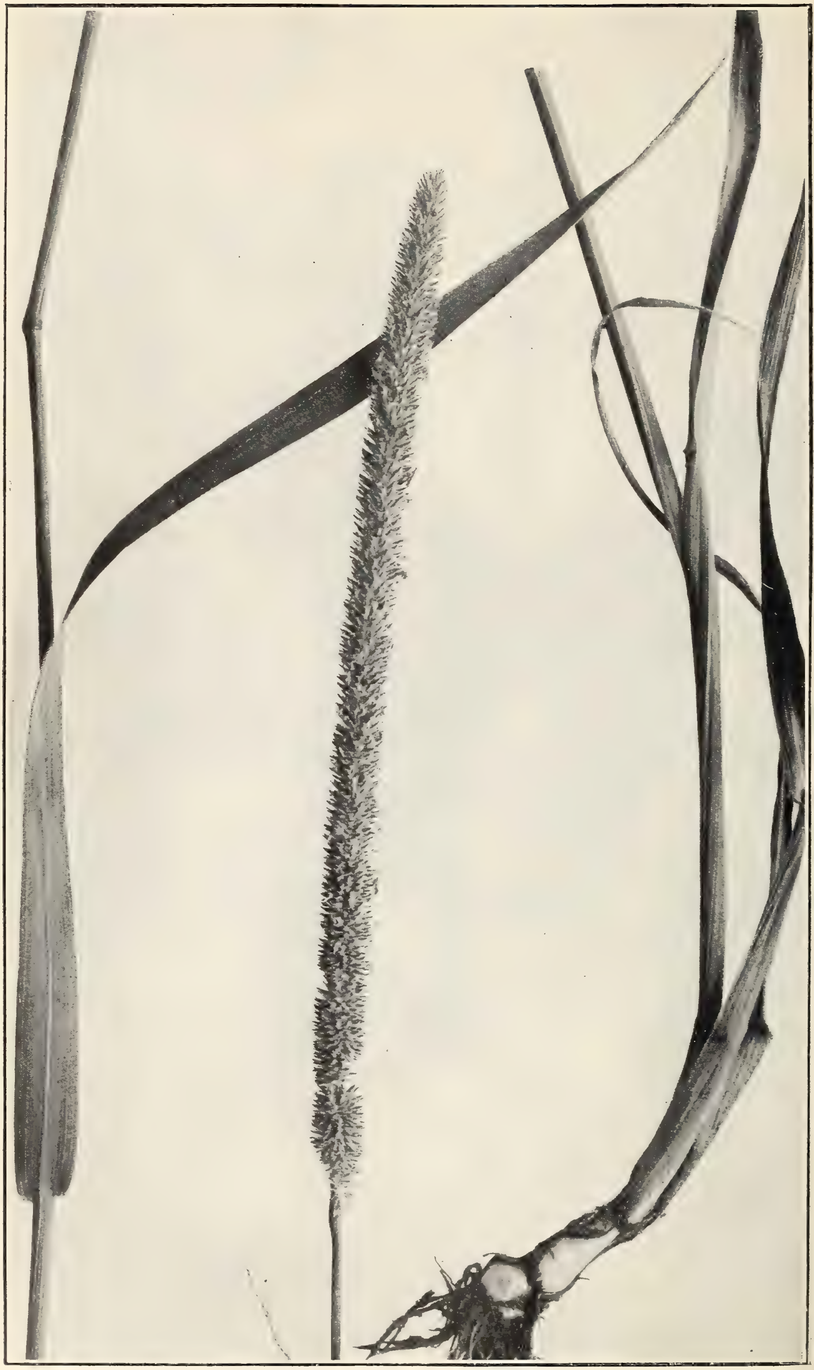
[1] The name *Agrostis alba* L. (Sp. Pl. 63. 1753) is of doubtful application. In the original publication the name is founded solely on the citation "Roy. lugdb. 59" (Royen, Flora Leydensis). Royen's citation of synonym refers to Poa (apparently *P. nemoralis*). There are several sheets in Linnæus's herbarium, one of which bears the name, *Agrostis alba*, in Linnæus's script. These specimens are the *Agrostis alba* as generally understood, but,



REDTOP (AGROSTIS PALUSTRIS).



TIMOTHY (PHLEUM PRATENSE).

color of the panicle. This species is an erect plant 2 to 4 feet high, producing rhizomes, and often decumbent at base, with flat blades, prominent, somewhat pointed ligule, and an open, usually reddish panicle, 2 to 12 inches long, contracted in fruit, the branches in whorls. Redtop is cultivated as a meadow and pasture grass in the Northern States, especially upon soils lacking in lime and upon soils too wet for timothy. In Pennsylvania and some other localities this species is called herd's-grass.

Agrostis capillaris L. (*A. tenuis* Sibth., *A. vulgaris* With., *A. alba vulgaris* Thurb.), Rhode Island bent,[1] differs from redtop in its smaller size, more delicate culms and foliage, short truncate ligule, smaller, more open, and fewer flowered panicle, not contracting after flowering. Stolons are usually absent but may be as much as 4 to 8 inches long. Rhode Island bent is often used as a lawn grass, especially in the Northeastern States, where the soil is lacking in lime and bluegrass does not thrive. In some botanical works the name *Agrostis canina* has been incorrectly applied to Rhode Island bent. *Agrostis canina* L., a European species occasionally introduced into the Eastern States, is a frequent constituent of the commercial seed of creeping bent. It is called velvet bent and gives promise of being a fine lawn grass.

Carpet bent, also called creeping bent, is a form of *A. stolonifera*. This produces stolons from 1 to 4 feet long and is also used as a lawn grass in the same region as that described for Rhode Island bent. The seed has been imported from southern Germany.

Fiorin is a name that was applied in England to a coast form with stoloniferous habit, long ligule, and narrow dense panicles. This form is found along the northern Atlantic coast of Europe and America and along the Pacific coast from British Columbia to northern California. It has been called *A. maritima* Lam. and *A. alba maritima* (Lam.) Meyer. It is apparently indigenous in America, while *A. capillaris* and *A. palustris* appear to be introductions.

Several native species of Agrostis are found in the western part of the United States, especially in mountain meadows. One of the commonest of the western species is *A. exarata* Trin., with contracted, sometimes spikelike, panicles and awned or awnless spikelets, found at all altitudes throughout the western portion of the United States.

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according to Jackson (Index to the Linnæan Herbarium, Proc. Linn. Soc. London, 124th Sess. Suppl. 1912), these specimens were added to the herbarium after 1753 and can not, therefore, have weight in determining the original application of the name. Linnæus did not refer, under *Agrostis alba*, to his flora of Sweden. It would appear that he did not intend to apply the name originally to a Swedish plant. The species usually known as *Agrostis alba* is common in Sweden, but apparently was included by Linnæus under *A. stolonifera*, to which it is closely allied. It was not until later that he applied the name to the species as now represented in his herbarium. Under these circumstances it seems best to drop the name *Agrostis alba*, as has been done by Piper (U. S. Dept. Agr. Bull. 692, 1918) and by Stapf, as indicated in a letter to Piper.

[1] See Piper, The Agricultural Species of Bent Grasses. U. S. Dept. Agr. Bull. 692. 1918.

This is an important range grass. Common on the Pacific slope is *A. diegoensis* Vasey, with creeping rhizomes, spreading panicles, and often awned spikelets.

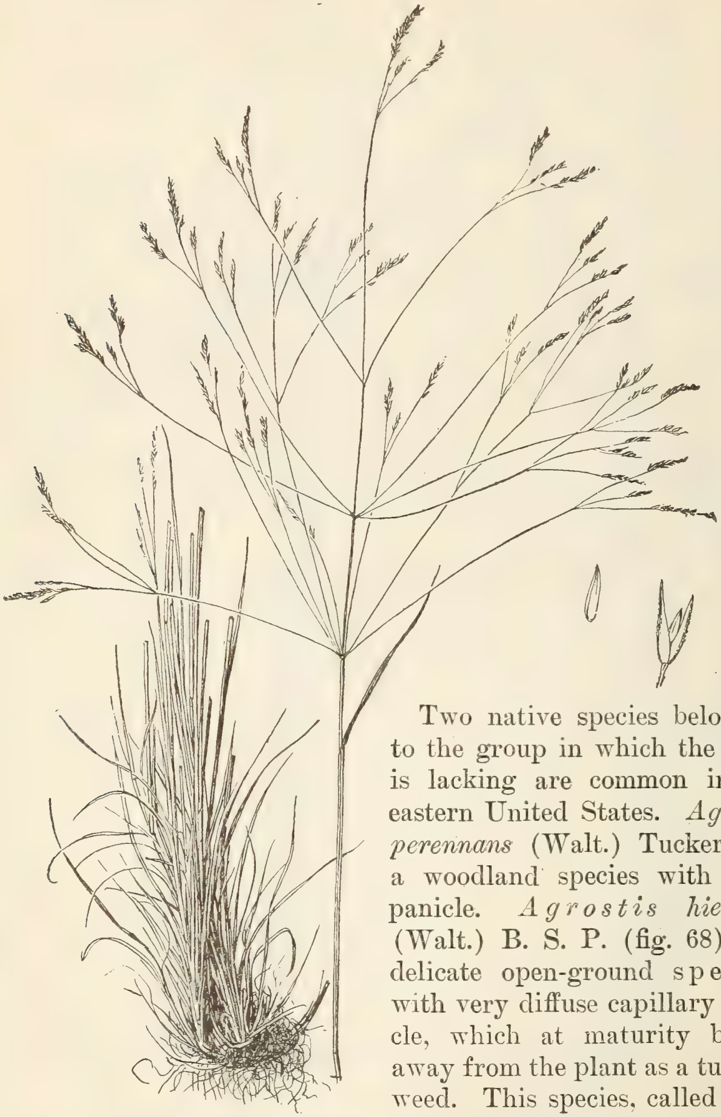

FIG. 68.—Tickle grass, *Agrostis hiemalis.* Plant, × ½; spikelet and floret, × 5.

Two native species belonging to the group in which the palea is lacking are common in the eastern United States. *Agrostis perennans* (Walt.) Tuckerm. is a woodland species with open panicle. *Agrostis hiemalis* (Walt.) B. S. P. (fig. 68) is a delicate open-ground species with very diffuse capillary panicle, which at maturity breaks away from the plant as a tumbleweed. This species, called hairgrass and tickle grass, is found throughout the United States.

Agrostis spica-venti L. (fig. 69), a European species, sparingly introduced in the Eastern States, has been made the type of a distinct genus, Apera, being distinguished by the prolongation of the rachilla and the long delicate awn from

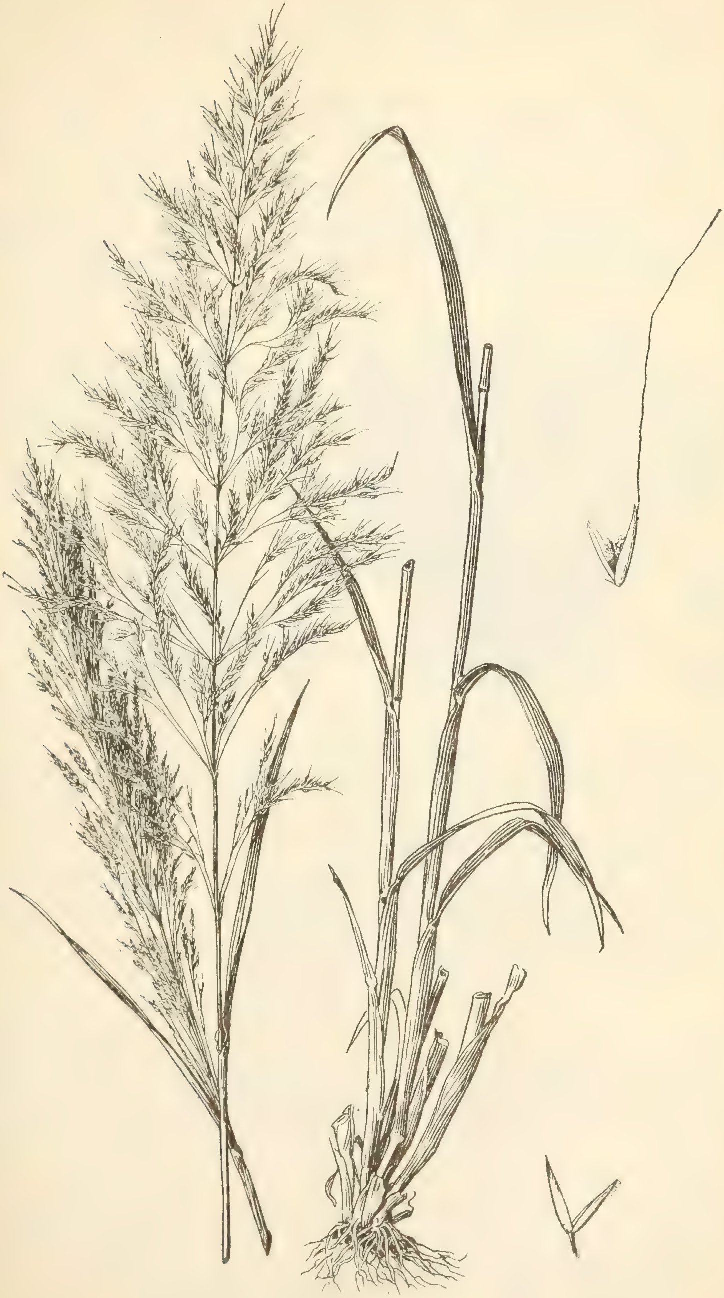

FIG. 69.—*Agrostis spica-venti.* Plant, × ½; glumes and floret, × 5.

just below the apex of the lemma. These characters are not deemed sufficient to separate it from our species. The rachilla is prolonged in *A. aequivalvis* and a similar awn is found in the annual *A. elliottiana* Schult.

For a revision of the species of Agrostis found in the United States, see Hitchcock, U. S. Dept. Agr., Bur. Pl. Ind. Bull. 68. 1905.

57. Phippsia (Trin.) R. Br.

Spikelets 1-flowered, disarticulating above the glumes, the rachilla not prolonged; glumes unequal, minute, the first sometimes wanting; lemma thin, somewhat keeled, 3-nerved, acute; palea a little shorter than the lemma, dentate.

A dwarf, tufted perennial, with narrow, few-flowered panicles of small spikelets. Species one, in the arctic regions of both hemispheres; also on the alpine summits of Colorado.

Type species: *Agrostis algida* Soland.

Colpodium subgenus Phippsia Trin., in Spreng. Neu. Entd. **2**: 37. 1821.

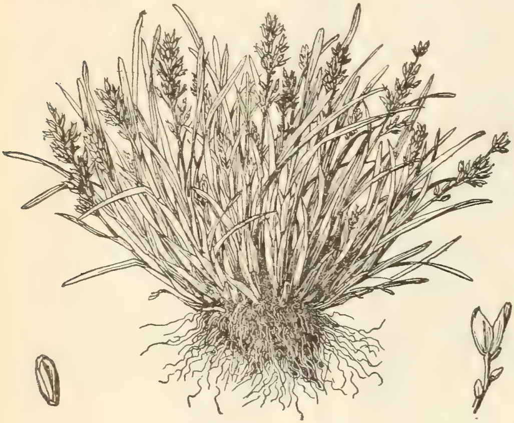

Fig. 70.—*Phippsia algida.* Plant, × ½; spikelet and branchlet of inflorescence with the glumes of lower spikelets remaining, and floret, all × 5.

Phippsia R. Br., Suppl. App. Parry's Voy. 184. 1824. A single species described, *P. algida*, based on *Agrostis algida* Soland.

Phippsia algida (Soland.) R. Br. (fig. 70) is known in the United States only from a few localities in the alpine regions of Colorado. It was first described as *Agrostis algida* by Solander.[1]

58. Coleanthus Seidel.

Spikelets 1-flowered; glumes wanting; lemma ovate, hyaline, terminating in a short awn; palea broad, 2-keeled.

A dwarf annual, about an inch high, with short flat blades and small few-flowered panicles. Species one, northern Eurasia, introduced in America.

Type species: *Schmidtia subtilis* Tratt.

Schmidtia Tratt., Fl. Oesterr. Kaiserth. **1**: 12, pl. 10, 1816, not Schmidtia Moench, 1802. Only one species described.

Coleanthus Seidel; Roem. and Schult., Syst. Veg. **2**: 276. 1817. Only one species described, *C. subtilis*, based on *Schmidtia subtilis*.

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[1] In Phipps Voy. 200. 1810.

Coleanthus subtilis (Tratt.) Seidel (fig. 71), introduced from Europe, grows on mud flats along the Columbia River, where it was collected by Howell (on Sauvies Island, Oreg.) and by Suksdorf (western Klickitat County, Wash.).

Mibora minima (L.) Desv. has been found at Plymouth, Mass. This, the only species of the genus, is a low annual, differing from Coleanthus and Phippsia in having glumes longer than the lemma, the very small spikelets in simple spikes. Introduced from Europe.

59. CINNA L.

Spikelets 1-flowered, disarticulting below the glumes, the rachilla forming a stipe below the floret and produced behind the palea as a minute bristle; glumes equal, 1-nerved; lemma similar to the glumes, nearly as long, 3-nerved, bearing a minute, short, straight awn just below the apex; palea apparently 1-nerved, 1-keeled.

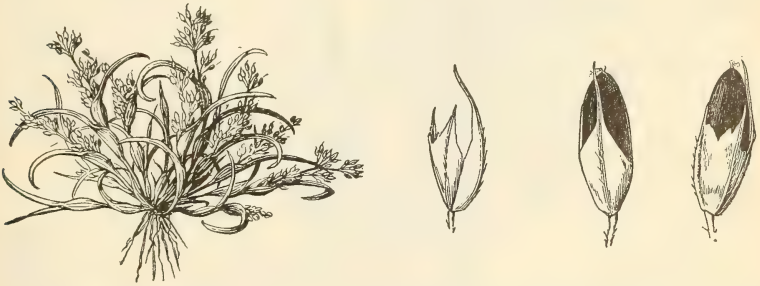


FIG. 71.—*Coleanthus subtilis.* Plant, × 1; lemma and palea and two views of spikelet with ripe caryopsis, × 20.

Tall perennial grasses, with flat blades and paniculate inflorescence. Species three, North America and northern Eurasia, two in the United States and one in Mexico and southward.

Type species: *Cinna arundinacea* L.

Cinna L., Sp. Pl. 5, 1753; Gen. Pl., ed. 5, 6. 1754. A single species is described.

Abola Adans., Fam. Pl. **2**: 31, 511. 1763. Based on "Cinna Lin."

Cinnastrum Fourn., Mex. Pl. **2**: 90. 1886. Two species are given, *C. miliaceum* and *C. poaeforme*, both referable to *Cinna poaeformis* (H. B. K.) Scribn. and Merr.

The prolongation of the rachilla is less than 0.5 mm. in our species, but in *Cinna poaeformis* of Mexico it is half as long as the palea. The palea is 1-nerved in *C. arundinacea.* In *C. poaeformis* the 2 nerves are close together but distinct. In *C. latifolia* the palea is apparently 1-nerved, but the 2 nerves separated when the palea is split along the keel.

Cinna arundinacea (fig. 72), with somewhat contracted panicle and spikelets 5 mm. long, grows in moist, usually shaded places in the eastern United States; *C. latifolia* (Trev.) Griseb., with open panicle and spikelets 4 mm. long, grows in damp woods across the continent in the northern part of the United States, mostly at medium and high elevations.

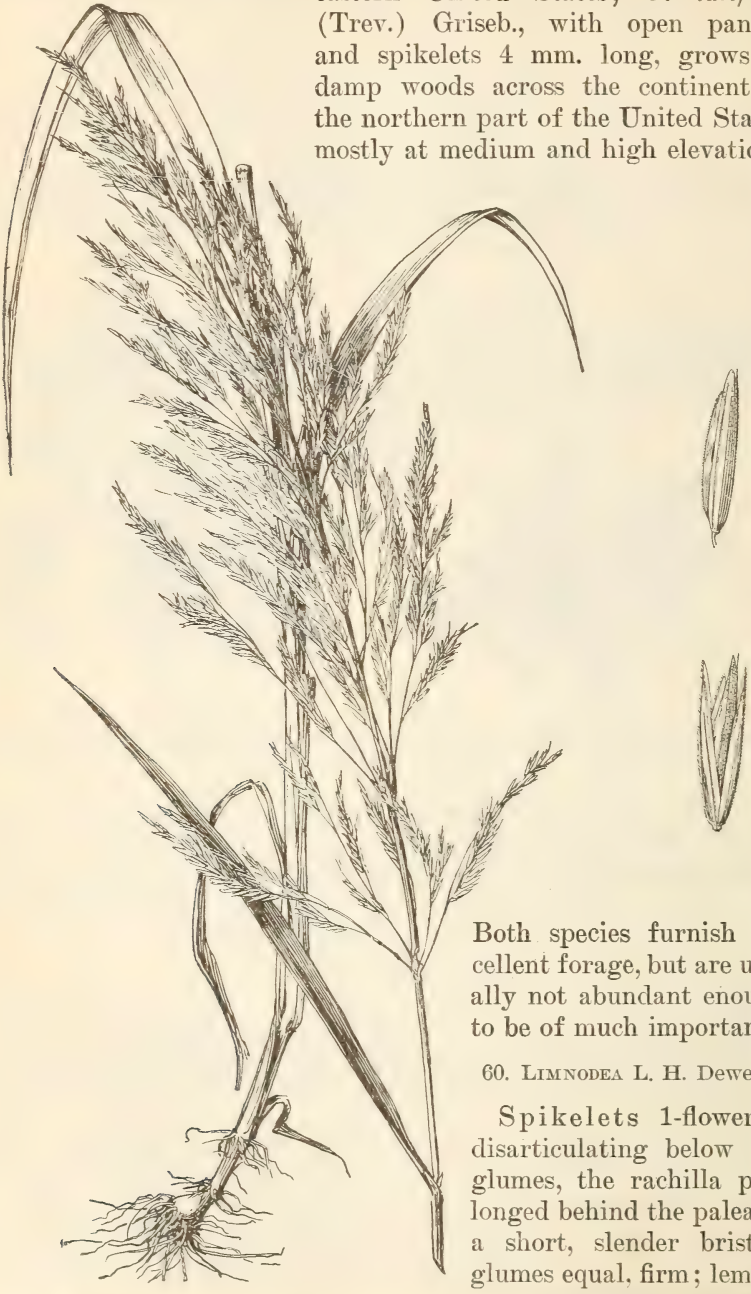


FIG. 72.—Wood reed-grass, *Cinna arundinacea.* Plant, × ½; spikelet and floret, × 5.

Both species furnish excellent forage, but are usually not abundant enough to be of much importance.

60. LIMNODEA L. H. Dewey.

Spikelets 1-flowered, disarticulating below the glumes, the rachilla prolonged behind the palea as a short, slender bristle; glumes equal, firm; lemma membranaceous, smooth, nerveless, 2-toothed at the apex, bearing from between the teeth a slender bent awn, twisted at base; palea a little shorter than the lemma.

A slender annual with flat blades and narrow panicles. Species one, Florida to Texas.

Type species: *Greenia arkansana* Nutt.

Greenia Nutt., Trans. Amer. Phil. Soc. **5**: 142, 1837, not Greenea Wight and Arn., 1834. Type *G. arkansana*, the only species described.

Sclerachne Torr.; Trin., Mém. Acad. St. Pétersb. VI. Sci. Nat. **4^1**: 273, 1841, not Sclerachne R. Br. and Benn., 1838. Two species are described, *S. arkansana* Torr. and *S. pilosa* Trin. The first, based on *Greenia arkansana* Nutt., is the type.

Thurberia Benth., Journ. Linn. Soc. Bot. **19**: 58, 1881, not Thurberia A. Gray, 1854. Type *Greenia arkansana* Nutt., the name Thurberia being substituted for Greenia.

Limnodea L. H. Dewey, Contr. U. S. Nat. Herb. **2**: 518. 1894. Only one species described.

Limnodea arkansana (Nutt.) L. H. Dewey (fig. 73), has probably no agricultural value. A form with pilose

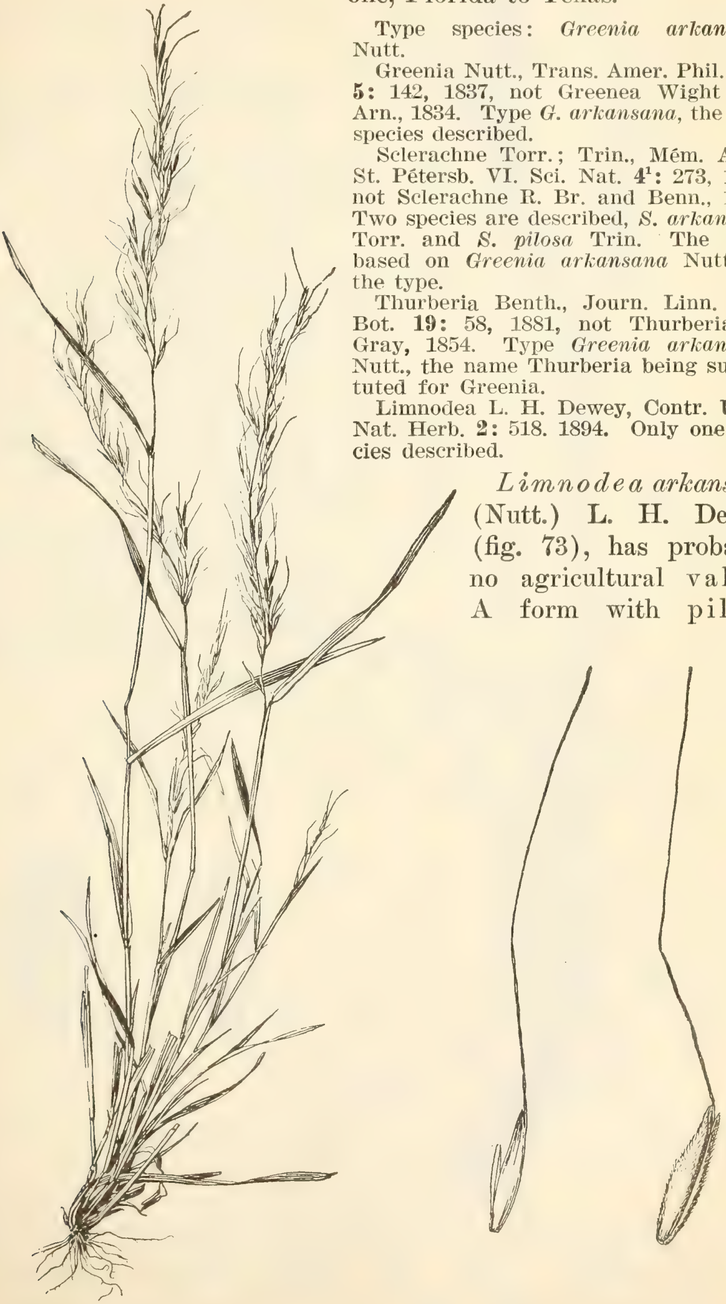


FIG. 73.—*Limnodea arkansana*. Plant, × ½; spikelet and floret, × 5.

glumes has been named *L. arkansana pilosa* (Trin.) Scribn.

61. ALOPECURUS L., the meadow foxtails.

Spikelets 1-flowered, disarticulating below the glumes, strongly compressed laterally; glumes equal, awnless, usually united at base, ciliate on the keel; lemma about as long as the glumes, 5-nerved, obtuse, the margins united at base, bearing from below the middle a slender dorsal awn, this included or exserted two or three times the length of the spikelet; palea wanting.

Low or moderately tall perennial grasses with flat blades and soft, dense, spikelike panicles. Species about 25, in temperate regions of the Northern Hemisphere. Of the eight North American species, two are introductions from Europe and two are widely distributed in

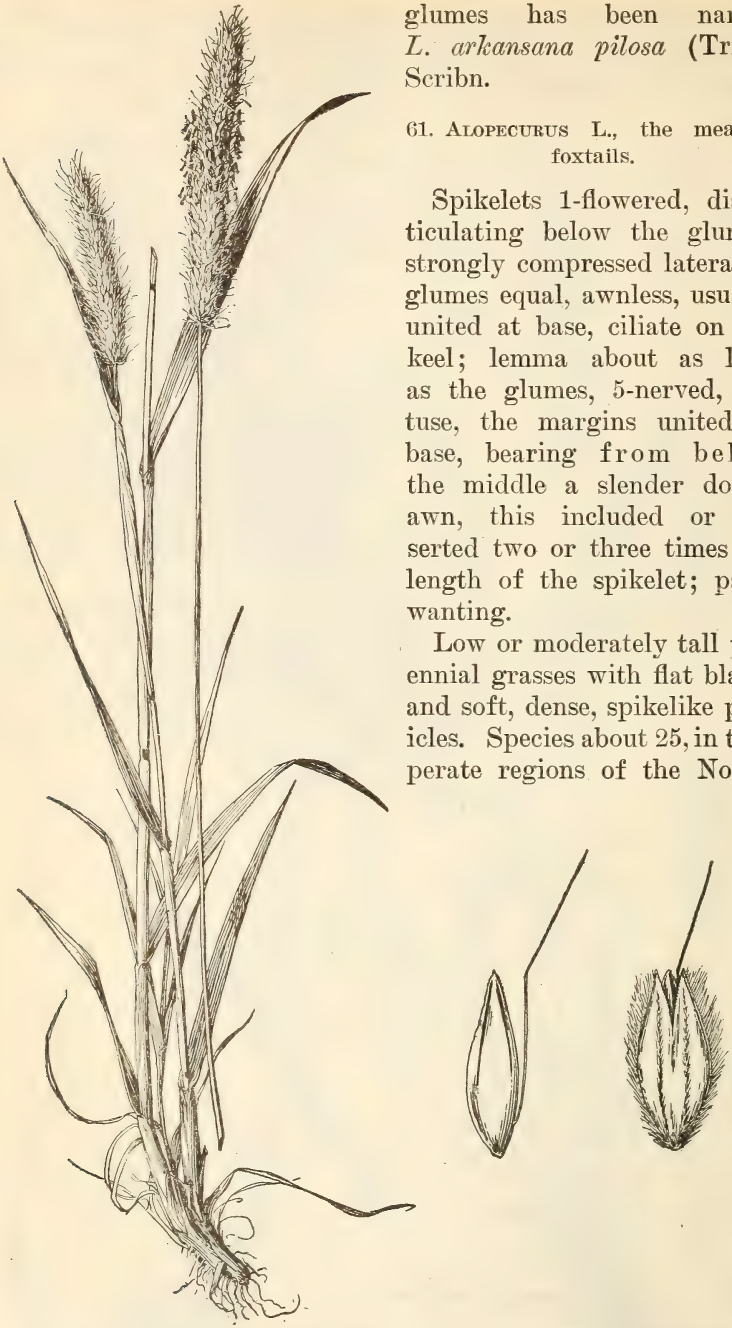


FIG. 74.—Meadow foxtail, *Alopecurus pratensis*. Plant, × ½; spikelet and floret, × 5.

Eurasia. Some of the European species with a distinct palea have been segregated as the genus Colobachne.

Type species: *Alopecurus pratensis* L.

Alopecurus L., Sp. Pl. 60, 1753; Gen. Pl., ed. 5, 30. 1754. Four species are described, *A. pratensis*, *A. geniculatus*, *A. hordeiformis*, and *A. monspeliensis*. The third and fourth species do not agree with Linnæus's generic description and are now referred, the third to Pennisetum and the fourth to Polypogon. The other two were well known to Linnæus and were described in his flora of Sweden. The first, being an economic species, is chosen as the type species of the genus.

Alopecurus pratensis L. (fig. 74), meadow foxtail, is sometimes used as a meadow grass in the eastern United States. It is recommended for mixtures on moist soil, being nutritious and producing early forage. Meadow foxtail is an erect grass, 2 to 3 feet tall, with short rhizomes, loose, often inflated, sheaths, and spikes or heads 2 to 4 inches long and about one-fourth of an inch thick. Introduced from Europe, where it is favorably known as a meadow grass.

Alopecurus geniculatus L. is a low, pale, soft grass, usually 6 to 18 inches high, with decumbent rooting bases and slender panicles 1 to 3 inches long and about one-eighth of an inch thick, the delicate awn bent and protruding about twice the length of the spikelet. Found in moist places across the continent. An allied and more common species, *A. aristulatus* Michx. (*A. geniculatus aristulatus* (Michx.) Torr.), is distinguished by the scarcely exserted awns. *Alopecurus alpinus* J. E. Smith (*A. occidentalis* Scribn.), a northern species extending into the Rocky Mountains of the United States, has a short, thick spike with spikelets woolly all over. *Alopecurus californicus* Vasey, of the northwestern Pacific coast region, has slender spikes, 1 to 3 inches long and one-fourth of an inch thick, the spikelets 3 mm. long. The species of Alopecurus are all palatable and nutritious, but usually are not found in sufficient abundance to be of great importance.

62. POLYPOGON Desf.

Spikelets 1-flowered, the pedicel disarticulating a short distance below the glumes, leaving a short-pointed callus attached; glumes equal, entire or 2-lobed, awned from the tip or from between the lobes, the awn slender, straight; lemma much shorter than the glumes, hyaline, usually bearing a slender straight awn shorter than the awns of the glumes.

Annual or perennial usually decumbent grasses, with flat blades and dense, bristly, spikelike panicles. Species about 10, in the temperate regions of the world, chiefly in the Eastern Hemisphere, three species being introductions into the United States.

Type species: *Alopecurus monspeliensis* L.

Polypogon Desf., Fl. Atlant. **1**: 66. 1798. Only one species described, this based on *Alopecurus monspeliensis* L.

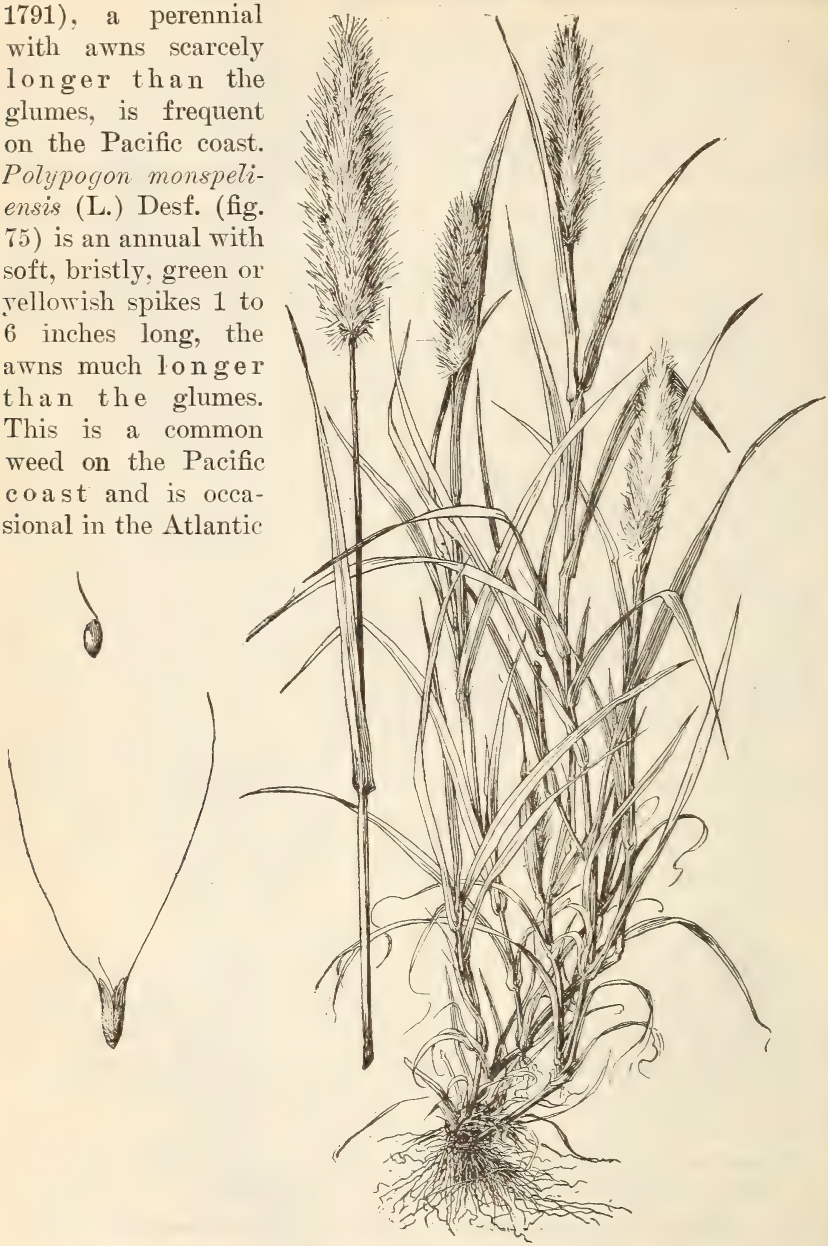
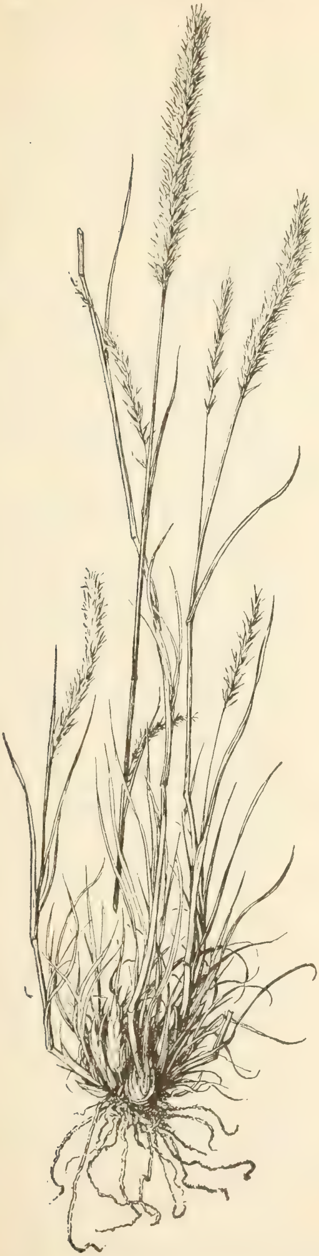


FIG. 75.—*Polypogon monspeliensis.* Plant, × ½; spikelet and floret, × 5.

Polypogon lutosus (Poir.) Hitchc. (*Agrostis lutosa* Poir., *P. littoralis* J. E. Smith, based on *Agrostis littoralis* With., 1796, not Lam., 1791), a perennial with awns scarcely longer than the glumes, is frequent on the Pacific coast. *Polypogon monspeliensis* (L.) Desf. (fig. 75) is an annual with soft, bristly, green or yellowish spikes 1 to 6 inches long, the awns much longer than the glumes. This is a common weed on the Pacific coast and is occasional in the Atlantic States. *Polypogon maritimus* Willd. is a rare species found in Georgia and California, and differs from the preceding in having deeply lobed lemmas, the lobes ciliate. Our species are relished by stock, and *P. monspeliensis* is sometimes sufficiently abundant on low meadows to be of importance.



63. Lycurus H. B. K.

Spikelets 1-flowered, the rachilla articulate above the glumes; glumes awned, the first usually 2-awned; lemma narrow, firm, longer than the glumes, terminating in a slender awn.

Low perennial grasses, with dense spikelike panicles, the spikelets borne in pairs, the lower of the pair sterile, the short branchlets deciduous. Species two, in arid regions from the southwestern United States to northern South America.

Type species: *Lycurus phleoides* **H. B. K.**

Lycurus H. B. K., Nov. Gen. and Sp. **1:** 141, pl. 45. 1816. Two species are described, *L. phleoides* and *L. phalaroides*. The first species, being figured, is chosen as the type.

Pleopogon Nutt., Journ. Acad. Nat. Sci. Phila. II. **1:** 189. 1848. A single species, *P. setosum*, is included. This is *Lycurus phleoides*.

Lycurus phleoides (fig. 76), the only species in the United States, is a low bunch-grass with slender erect culms about a foot high, with a dense, narrow, lead-color panicle 1 or 2 inches long. The species, sometimes called Texas timothy and wolftail, is common on the Mexican Plateau and extends north to Texas, Colorado, and Arizona. It is often an important constituent of grazing areas.

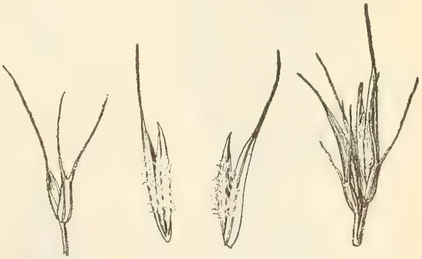


Fig. 76.—Wolftail, *Lycurus phleoides*. Plant, × ½; group of two spikelets, glumes of fertile spikelet, and two views of fertile floret, × 5.

64. Phleum L.

Spikelets 1-flowered, laterally compressed, disarticulating above the glumes; glumes equal, membranaceous, keeled, abruptly mucronate or awned; lemma shorter than the glumes, hyaline, broadly truncate, 3 to 5 nerved; palea narrow, nearly as long as the lemma.

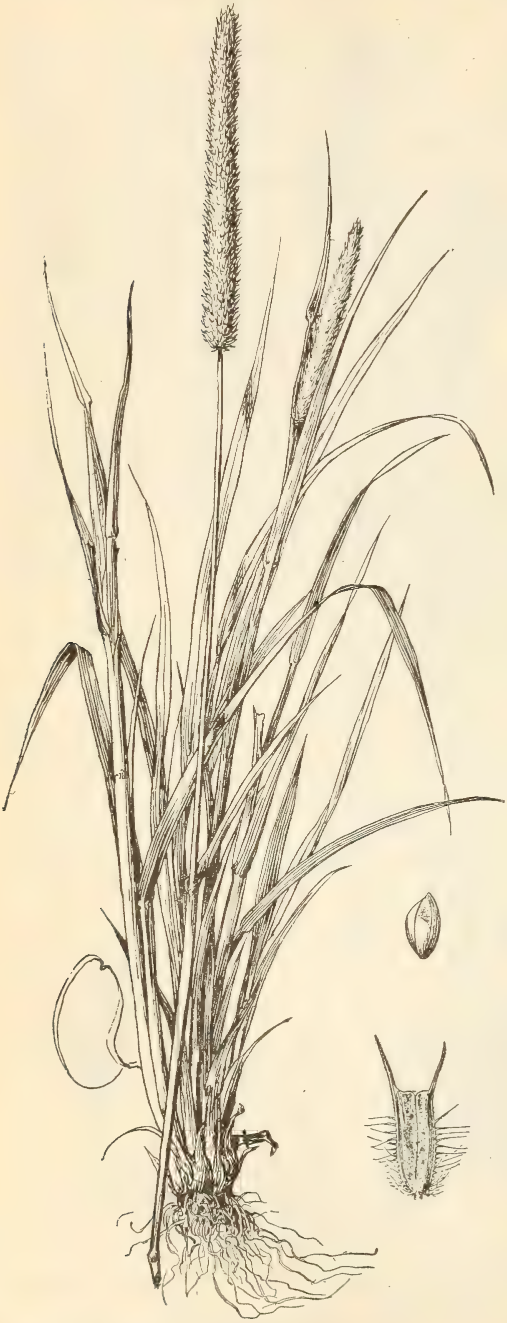


Fig. 77.—Timothy, *Phleum pratense.* Plant, × ½; spikelet and floret, × 5.

Annuals or perennials, with erect culms, flat blades, and dense, cylindric panicles. About 10 species, in the temperate regions of both hemispheres.

Type species: *Phleum pratense* L.

Phleum L., Sp. Pl. 59, 1753; Gen. Pl., ed. 5, 29. 1754. Four species are described, *P. pratense*, *P. alpinum*, *P. arenarium*, and *P. schoenoides.* The first species is chosen as the type because it is the only cultivated species in the genus. The first three species are still retained in Phleum; the fourth is referred to Heleochloa.

Stelephuras Adans., Fam. Pl. **2**: 31, 607. 1763. Based on Phleum L.

Four species of Phleum are found in the United States. Our only native species is *P. alpinum* L., mountain timothy, a perennial with short spikes, two or three times as long as wide, found in the northern regions of Eurasia and America and extending south in the mountains of New England, in the Rocky Mountains to Mexico, and in the Sierra Nevada and Coast Ranges to the San Jacinto Mountains.

Mountain timothy produces a fair amount of nutritious forage, which remains green till late in the season and is considered a valuable late sheep feed. It is an important constituent of mountain meadows. This species is distinguished from common timothy by the shorter, broader heads and by the absence of the swollen base of the stem or so-called bulb. Two species, *P. graecum* Boiss. and Heldr. and *P. bellardi* Willd., are annuals introduced from Europe and found here only at a few coast points on dumping grounds for ballast.

The fourth species is timothy, *Phleum pratense* L. (Pl. XIV; fig. 77), an erect, short-lived perennial, 2 to 4 feet tall, with elongate cylindric inflorescences or "heads" several times longer than broad. The stems are swollen at the base, and the glumes, like those of mountain timothy, are ciliate on the keel. Timothy, a native of Europe and northern Asia, is now commonly cultivated in this country and in Europe as a meadow grass, and is found growing without cultivation in waste places, roadsides, and old fields throughout most of the United States. It is the most important meadow grass grown in America, and timothy hay is the standard for all grass hay sold on the market. The region of the United States favorable for the growing of timothy is the crop area known as the cool humid region, which includes the northeastern portion west to the Great Plains and south to Virginia and Missouri, or farther in the mountains. Another timothy area is found on the Pacific coast from northern California to Puget Sound. Much timothy is grown in favorable localities in the western mountains. In some localities timothy is known as herd's-grass.

See Evans, U. S. Dept. Agr., Farmers' Bull. 502, 1912; McClure, U. S. Dept. Agr., Farmers' Bull. 508, 1912; Williams, U. S. Dept. Agr. Yearbook, **1896:** 147, 1897; Scribner, U. S. Dept. Agr., Div. Agrost. Bull. **20:** fig. 47. 1900.

65. GASTRIDIUM Beauv.

Spikelets 1-flowered, the rachilla disarticulating above the glumes, prolonged behind the palea as a minute bristle; glumes unequal, somewhat enlarged or swollen at the base; lemma much shorter than the glumes, hyaline, broad, truncate, awned or awnless; palea about as long as the lemma.

Annual grasses, with flat blades and pale, shining, spikelike panicles. Species two, in the Mediterranean region; one introduced into the United States.

Type species: *Milium lendigerum* L.

Gastridium Beauv., Ess. Agrost. 21, pl. 6, f. 6. 1812. Beauvois mentions only one species, *Milium lendigerum*, but the description of the plate bears the name *Gastridium australe*.

Gastridium ventricosum (Gouan) Schinz and Thell.[1] (*G. lendigerum* (L.) Gaud.) (fig. 78), with an awned lemma, a common weed on the Pacific coast, appears to have no economic value.

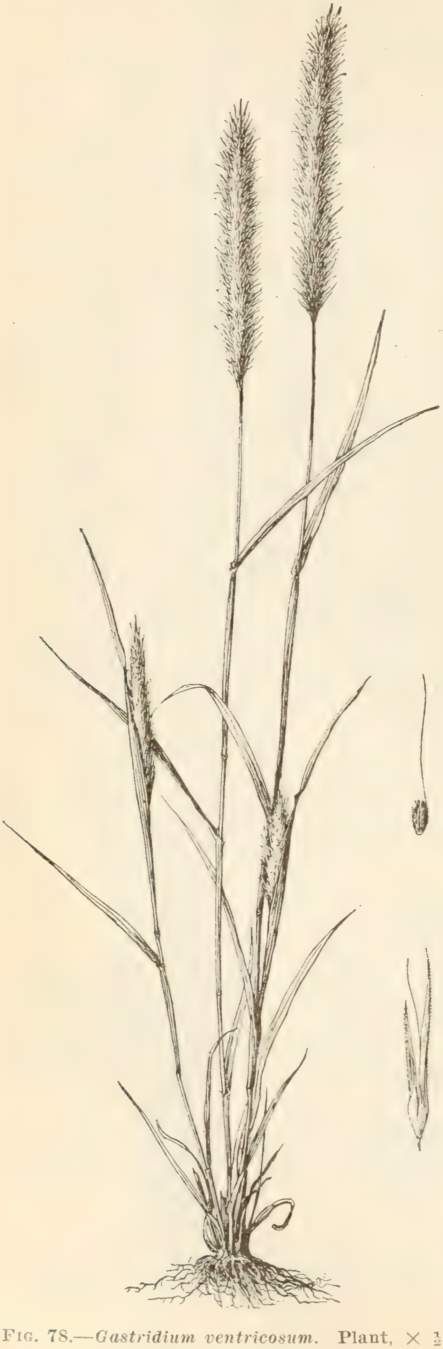


FIG. 78.—*Gastridium ventricosum*. Plant, × ½; spikelet and floret, × 5.

66. LAGURUS L.

Spikelets 1-flowered, the rachilla disarticulating above the glumes, pilose under the floret, produced beyond the palea as a bristle; glumes equal, thin, 1-nerved, villous, gradually tapering into a plumose aristiform point; lemma shorter than the glumes, thin, glabrous, bearing on the back above the middle a slender, exserted, somewhat geniculate, dorsal awn, the summit bifid, the divisions delicately awn-tipped; palea narrow, thin, the two keels ending in minute awns.

An annual grass, with pale, dense, ovoid or oblong woolly heads. Species one, in the Mediterranean region and introduced sparingly in California.

Type species: *Lagurus ovatus* L. Lagurus L., Sp. Pl. 81, 1753; Gen. Pl., ed. 5, 34. 1754. Only one species described.

Lagurus ovatus (fig. 79) is sometimes cultivated as an ornamental, the woolly heads being used for dry bouquets.

67. EPICAMPES Presl.

Spikelets 1-flowered, the rachilla disarticulating above the glumes; glumes about equal; lemma equaling or longer than the glumes, 3-nerved, often bearing a slender awn just below the tip.

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[1] This name is based on *Agrostis ventricosa* Gouan, Hort. Monsp. 39, pl. 1, f. 2, 1762, which was published earlier in the year than *Milium lendigerum* L., Sp. Pl., ed. 2, 91, 1762, as shown by Linnæus's reference to Gouan's work in the preface to the second edition of his Species Plantarum.

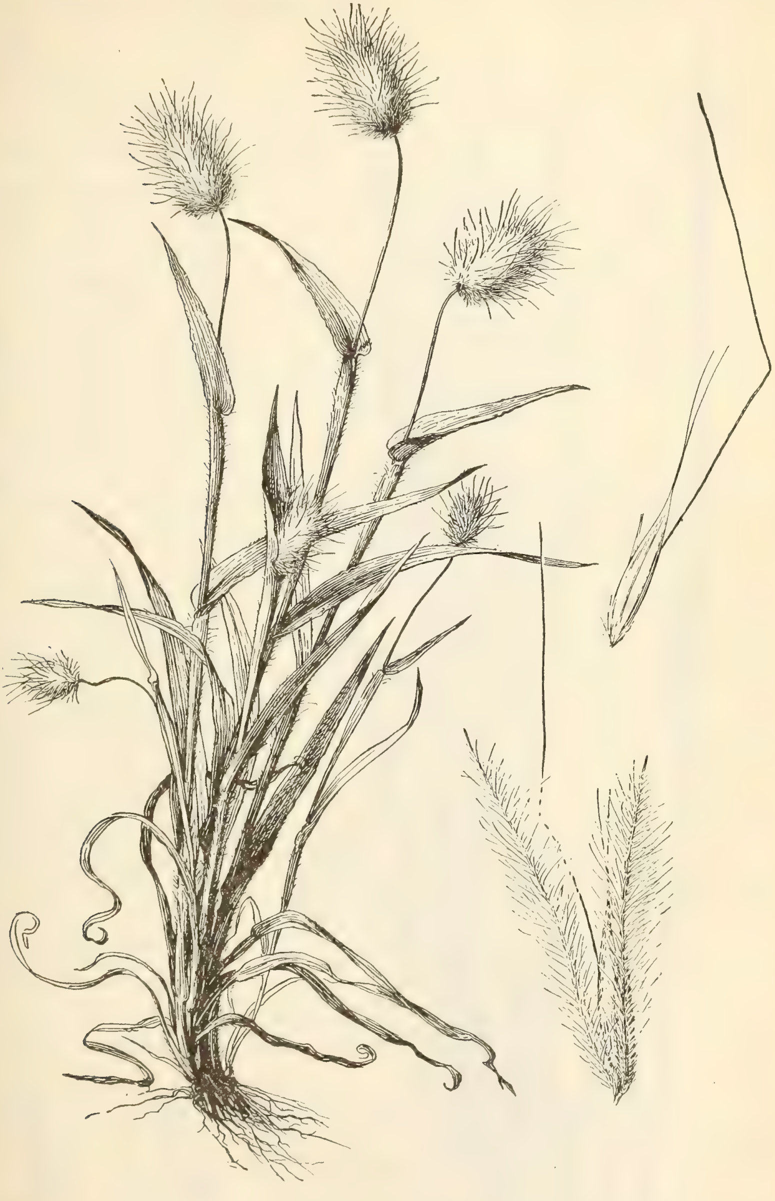

Fig. 79.—Hare's-tail grass, *Lagurus ovatus*. Plant, × ½; spikelet and floret, × 5.

Tall cespitose perennials, with open, narrow, or spikelike panicles. Species 15, northern South America to Mexico, 5 extending into the southwestern United States.

Type species: *Epicampes strictus* Presl.

Epicampes Presl, Rel. Haenk. **1:** 235, pl. 39. 1830. Only one species described.

Crypsinna Fourn., Mex. Pl. **2:** 90. 1886. Three species are mentioned, *C. stricta*, *C. macroura*, and *C. setifolia.* In the generic description the panicle is said to be densely spiciform. This applies best to the second species, *C. macroura*, which is chosen as the type.

One species, *Epicampes rigens* Benth. (fig. 80), with long, slender, cylindric, pale, spikelike panicles, the glumes shorter than the lemma, is found from western Texas to southern California. This species, called deer-grass, and the four other species, *E. ligulata* Scribn., *E. berlandieri* Fourn., *E. subpatens* Hitchc.,[1] and *E. emersleyi*

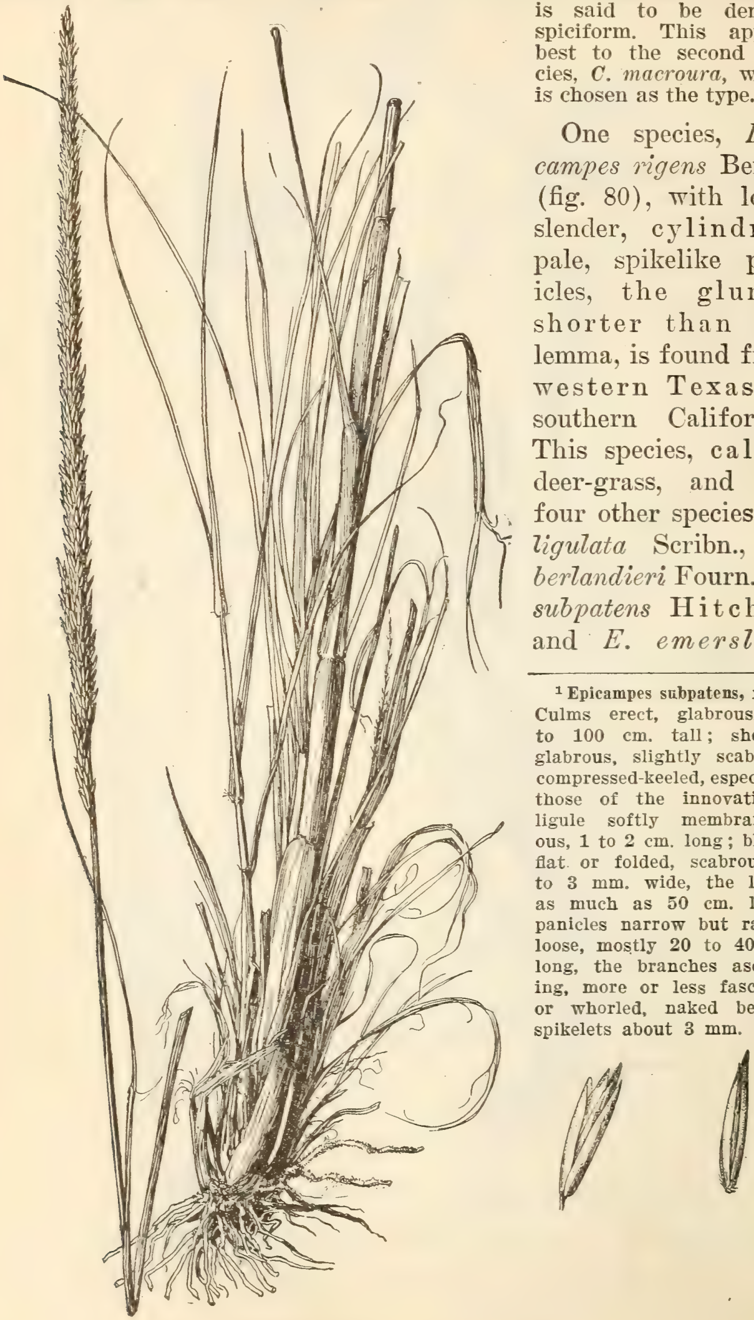

FIG. 80.—Deer-grass, *Epicampes rigens.* Plant, × ½; spikelet and floret, × 5.

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[1] **Epicampes subpatens, n. sp.** Culms erect, glabrous, 50 to 100 cm. tall; sheaths glabrous, slightly scabrous, compressed-keeled, especially those of the innovations; ligule softly membranaceous, 1 to 2 cm. long; blades flat or folded, scabrous, 1 to 3 mm. wide, the lower as much as 50 cm. long; panicles narrow but rather loose, mostly 20 to 40 cm. long, the branches ascending, more or less fascicled or whorled, naked below; spikelets about 3 mm. long,

(Vasey) Hitchc. (*Muhlenbergia emersleyi* Vasey, *M. vaseyana* Scribn.), are forage grasses. A Mexican species, *E. macroura* Benth., is of considerable economic importance, the roots being used in the manufacture of scrubbing brushes.

68. Muhlenbergia Schreb.

Spikelets 1-flowered, the rachilla disarticulating above the glumes; glumes usually shorter than the lemma, obtuse to acuminate or awned, the first sometimes small or rarely obsolete; lemma firm-membranaceous, 3 to 5 nerved, with a very short, usually minutely pilose callus, the apex acute, sometimes bidentate, extending into a straight or flexuous awn, or sometimes only mucronate.

Perennial or rarely annual low or moderately tall grasses, tufted or rhizomatous, the culms simple or much branched, the inflorescence a narrow or open panicle. Species about 80, mostly in Mexico and the southwestern United States, a few in the eastern part of the Old World; 40 species in the United States.

Type species: *Muhlenbergia schreberi* Gmel.

Muhlenbergia Gmel., Syst. Nat. **2**: 171. 1791. Only one species mentioned.

Dilepyrum Michx., Fl. Bor. Amer. **1**: 40. 1803. Two species are described, *D. aristosum*, which is *Brachyelytrum erectum*, and *D. minutiflorum*, which is *Muhlenbergia schreberi* Gmel. They are equally eligible as the type. The second is chosen, in order to conserve the generic name Brachyelytrum.

Podosemum Desv., Nouv. Bull. Soc. Philom. Paris **2**: 188. 1810. The type is *Stipa capillaris* Lam. (*P. capillaris* Desv.), the only species mentioned.

Clomena Beauv., Ess. Agrost. 28, pl. 7, f. 10. 1812. The type is *C. peruviana*, the only species mentioned. This is *Muhlenbergia peruviana* (Beauv.) Steud.

Trichochloa Beauv., Ess. Agrost. 29, pl. 8, f. 2. 1812. The type and only species is *T. purpurea*. This has not been identified. Roemer and Schultes say it is *Trichochloa expansa* DC. (*Muhlenbergia expansa* (DC.) Trin.).

Tosagris Beauv., Ess. Agrost. 29, pl. 8, f. 3. 1812. The type is *T. agrostidea*, the only species mentioned. This has not been identified, but it appears to be a species of Muhlenbergia.

Sericrostis Raf., Neogenyt. 4. 1825. "Type *Stipa sericea* Mx. or *diffusa* Walter." This is *Muhlenbergia capillaris* (Lam.) Trin.

Calycodon Nutt., Journ. Acad. Phila. II. **1**: 186. 1848. The type is *C. montanum* (*Muhlenbergia montana* Hitchc.), the only species described.

Vaseya Thurb., in Gray, Proc. Acad. Phila. **1863**: 79. 1863. The type is *V. comata* Thurb., the only species described. This is *Muhlenbergia andina* (Nutt.) Hitchc. (*Calamagrostis andina* Nutt.).

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often tinged with purple; glumes about as long as the lemma, papery, acutish, scabrous; lemma narrowed and scabrous above, villous below, awnless, or occasionally those of a few of the spikelets with a flexuous awn about 1 cm. long.

Type, U. S. National Herbarium no. 905799, collected in a rocky ravine, Guadeloupe Mountains, near Queen, N. Mex., altitude 7,000 feet, Sept. 5, 1915, by A. S. Hitchcock, no. 13541.

This species is closely allied to *Epicampes emersleyi*, from which it differs in the awnless spikelets and larger, looser, and more spreading panicles. The writer examined the two forms in the Guadeloupe Mountains, southern New Mexico, and concluded from these field observations that the awned and awnless forms represented two distinct but closely allied species. The delicate awns are not noticeable at a distance but the more open panicle was always found to be associated with the awnless spikelets.

Other specimens in the U. S. National Herbarium.—Texas: Limpia Canyon, *Nealley* 133. Chisas Mountains, *Bailey* 392. Guadeloupe Mountains, *Bailey* 739. Western Texas, *Wright* 729. New Mexico: Socorro, *Plank* 53. Silver City, *Greene* 439. Arizona: Patagonia, *Hitchcock* 3719. Chiracahua Mountains, *Toumey* 15a. Santa Catalina Mountains, *Griffiths* 7149.

[1] Syst. Veg. **2**: 384. 1817.

Chaboissaea Fourn., Mex. Pl. **2**: 112. 1886. A single species, *C. ligulata*, is included. This is *Muhlenbergia ligulata* (Fourn.) Scribn. and Merr.

Muhlenbergia is a somewhat artificial genus, including species of very diverse habit. It differs from Sporobolus in the 3-nerved awned or mucronate lemma, and from Agrostis in the firmer lemma, usually longer than the glumes. One group, including *M. squarrosa* (Trin.) Rydb. (fig. 81), *M. repens* (Presl) Hitchc., and their allies, has been usually referred to Sporobolus. The species of this group are included in Muhlenbergia because of the 3-nerved mucronate or awned lemmas, but they form a distinct section or possibly a distinct genus.

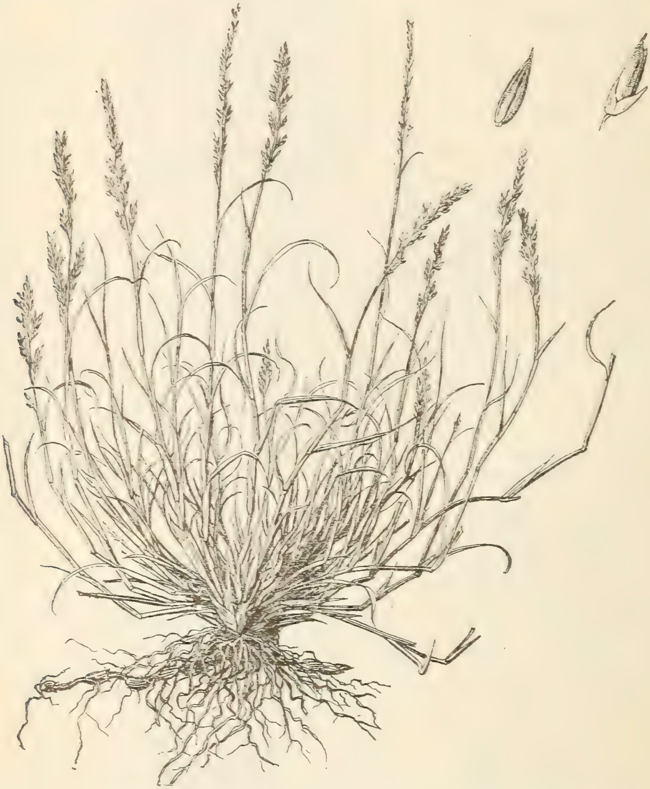

FIG. 81.—*Muhlenbergia squarrosa.* Plant, × ½; spikelet and floret, × 5.

In *M. repens* the lateral nerves of the lemma are commonly obsolete, and the apex is sometimes scarcely mucronate.

Of the species found in the United States two are annuals, *M. depauperata* Scribn., with acuminate or awned glumes, and *M. microsperma* (DC.) Kunth, with obtuse glumes, both growing in the extreme Southwest. The latter species produces cleistogenes in the axils of the lower sheaths. *Muhlenbergia mexicana* (L.) Trin. and its allies have branching stems and numerous panicles. The glumes are reduced in *M. schreberi* (fig. 82), the type species, the first being obsolete and the second not over 0.5 mm. long. In *M. montana* (Nutt.) Hitchc. (*Calycodon montanum* Nutt.; *Muhlenbergia trifida* Hack.; *M. gracilis* of authors, not H. B. K.) the second glume is 3-toothed. *Muhlenbergia capillaris* (Lam.) Trin. (fig. 83), of the Southern States, is a handsome perennial with diffuse purple panicles.

There are nine species in the Eastern States; the others are western or mainly southwestern. Many of the western species are important range grasses and often form a considerable proportion of the grass flora of the arid and semiarid regions. The commonest of these are *M. montana* and *M. wrightii* Vasey. The second has a spikelike leaden-hued panicle.

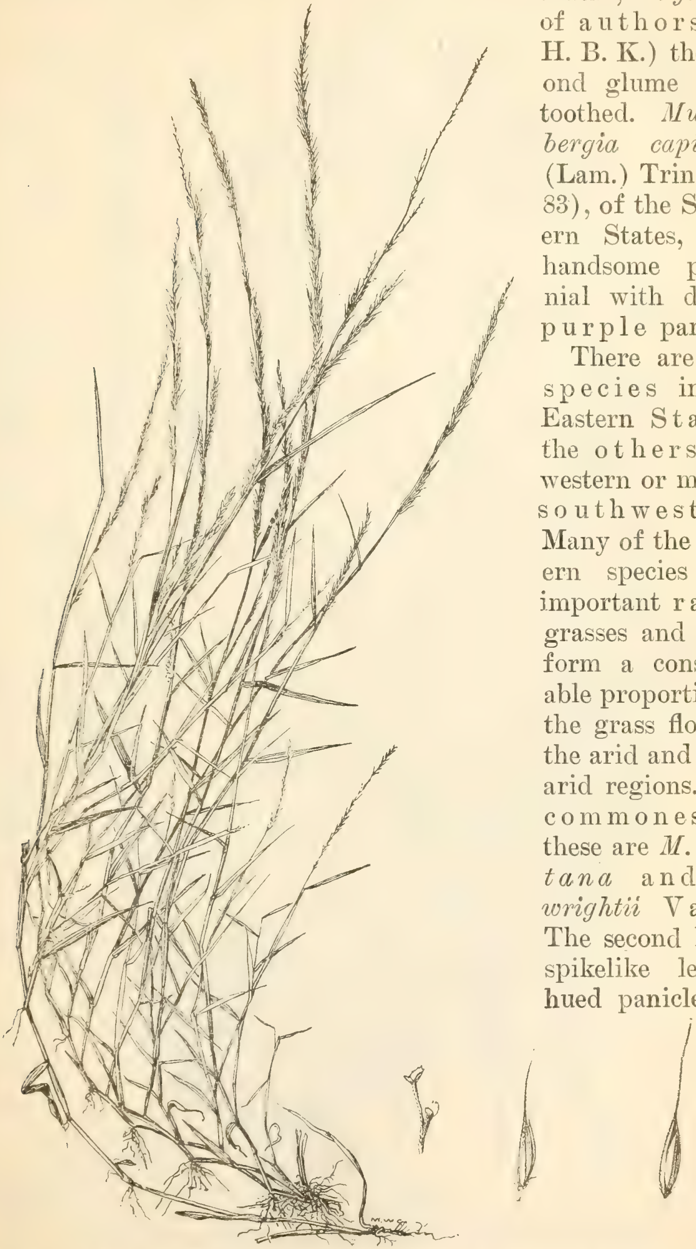

FIG. 82.—Nimble Will. *Muhlenbergia schreberi.* Plant, × ½; branchlet showing both first and second glumes of two spikelets, spikelet with obsolete first glume, and floret, all × 5.

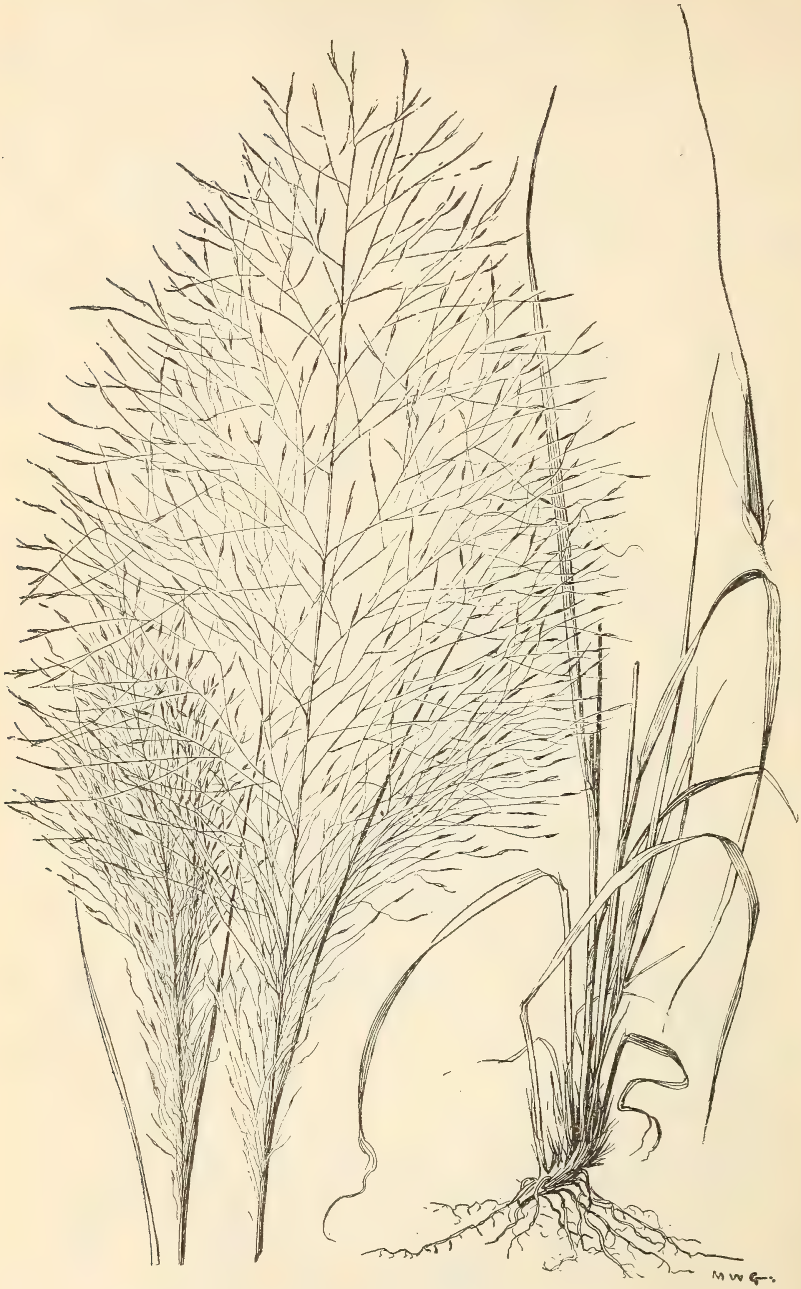

FIG. 83.—*Muhlenbergia capillaris.* Plant, × ½; spikelet, × 5.

69. Sporobolus R. Br.

Spikelets 1-flowered, the rachilla disarticulating above the glumes; glumes awnless, usually unequal, the second often as long as the spikelet; lemma membranaceous, 1-nerved, awnless; palea usually prominent and as long as the lemma or longer; seed free from the pericarp.

Annual or perennial grasses, with small spikelets in open or contracted

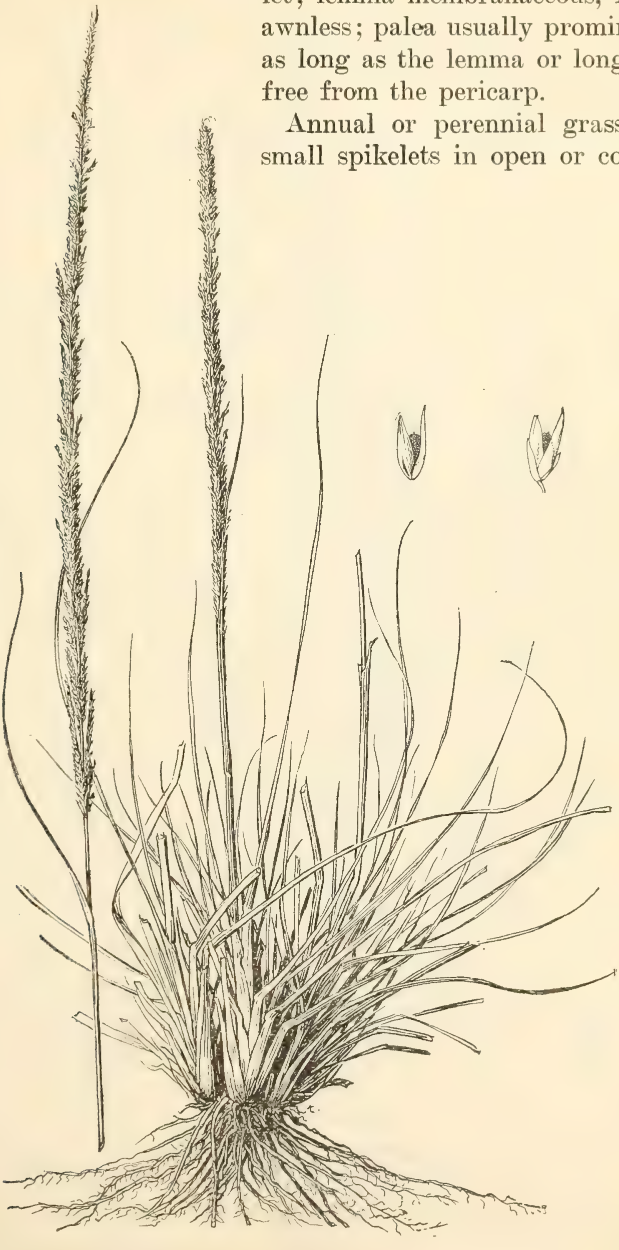

Fig. 84.—Smut-grass, *Sporobolus berteroanus.* Plant, × ½; spikelet and floret, × 5.

panicles. Species about 95, in the warm regions of both hemispheres, most abundant in America; 36 species in the United States.

Type species: *Agrostis indica* L.

Sporobolus R. Br., Prodr. Fl. Nov. Holl. 169. 1810. Three species are described, *S. indicus*, *S. elongatus*, and *S. pulchellus*. Brown states that Sporobolus includes Agrostis species of Linnæus. Of the three species described by Brown only the first was known to Linnæus and included by him under Agrostis. Hence the first species is chosen as the type.

Agrosticula Raddi, Agrost. Bras. 33, pl. 1, f. 2. 1823. Type *A. muralis*, the only species described.

Bennetia Raf., Bull. Bot. Seringe 1: 220. 1830. *Agrostis juncea* Michx. is the only species included. This is *Sporobolus gracilis* (Trin.) Merr.

Crystostachys Steud., Syn. Pl. Glum. 1: 181. 1854. The type is *C. vaginata*, the only species described. From the description this appears to be *Sporobolus vaginaeflorus*.

Bauchea Fourn., Mex. Pl. 2: 87. 1886. Type *B. karwinskyi*, the only species described. This is *Sporobolus wrightii*.

The fruit is free from the lemma and palea, and falls readily from the spikelet at maturity. Because of this character the species have been called drop-seed grasses. The genus differs from Muhlenbergia in having 1-nerved awnless lemmas and from Agrostis in having lemmas as long as the glumes or longer and as firm.

Four species of the United States are annual. One of them, *Sporobolus vaginaeflorus* (Torr.) Wood, is called poverty grass, because it grows in sterile soil. This has narrow panicles, partly or wholly inclosed in the sheaths. Several of the perennial species have creeping rhizomes. One of these, *S. virginicus* (L.) Kunth, is a common seashore grass in the Southern States. It has erect stems 6 to 10 inches tall, with spikelike panicles of pale spikelets. The other species of the genus are erect bunch-grasses. *Sporobolus berteroanus* (Trin.) Hitchc. and Chase (fig. 84), with long, slender, spikelike panicles, is common in the Southern States (*S. indicus* of the manuals, not *S. indicus* (L.) R. Br.). This species is called smut-grass, because the inflorescence is frequently affected with a black fungus. The glumes are about equal and much shorter than the lemma. *Sporobolus cryptandrus* (Torr.) Gray (fig. 85) is common on sandy soil, especially in the interior of the country. This has very small spikelets in panicles sometimes partly inclosed in the upper sheath, only the upper portion spreading, or even entirely inclosed in the swollen sheaths. There is a conspicuous tuft of hairs at the summit of the sheaths. In winter the leaves and stems become fibrous and much frayed out by the wind.

Two species of the Southwest are important forage grasses in the arid and semiarid regions. *Sporobolus airoides* Torr. (fig. 86), growing in dense, tough clumps, the stems 1 or 2 feet high, and with large spreading panicles, is found on somewhat alkaline soil and is called bunch-grass or alkali saccaton. It ranges from Nebraska to

Montana and Texas. *Sporobolus wrightii* Munro, saccaton, is much taller, with a large but narrow panicle. This is found from Arizona to western Texas.

Most of the perennial species of Sporobolus are palatable forage grasses, but few of them are abundant enough to be of importance. On the Arizona Plateau, *S. interruptus* Vasey is an important range grass. It is called black sporobolus, because of the dark, narrow, loosely flowered panicle.

70. Blepharoneuron Nash.

Spikelets 1-flowered, the rachilla disarticulating above the glumes; glumes subequal, rather broad; lemma 3-nerved, the nerves densely pilose; palea densely pilose between the two nerves.

A perennial grass with an open, narrow panicle. Species one; southwestern United States and northern Mexico.

Type species: *Vilfa tricholepis* Torr.

Blepharoneuron Nash, Bull. Torrey Club **25**: 88. 1898. Only one species mentioned, *B. tricholepis* (Torr.) Nash.

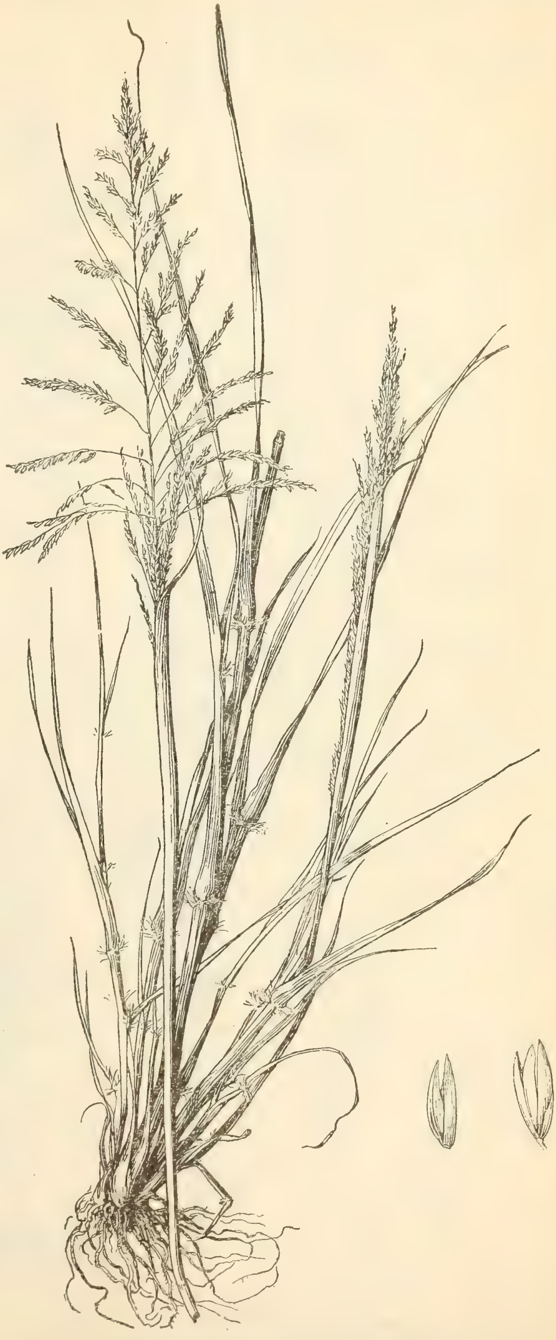

Fig. 85.—Sand dropseed, *Sporobolus cryptandrus*. Plant, × ½; spikelet and floret, the palea splitting, × 5.

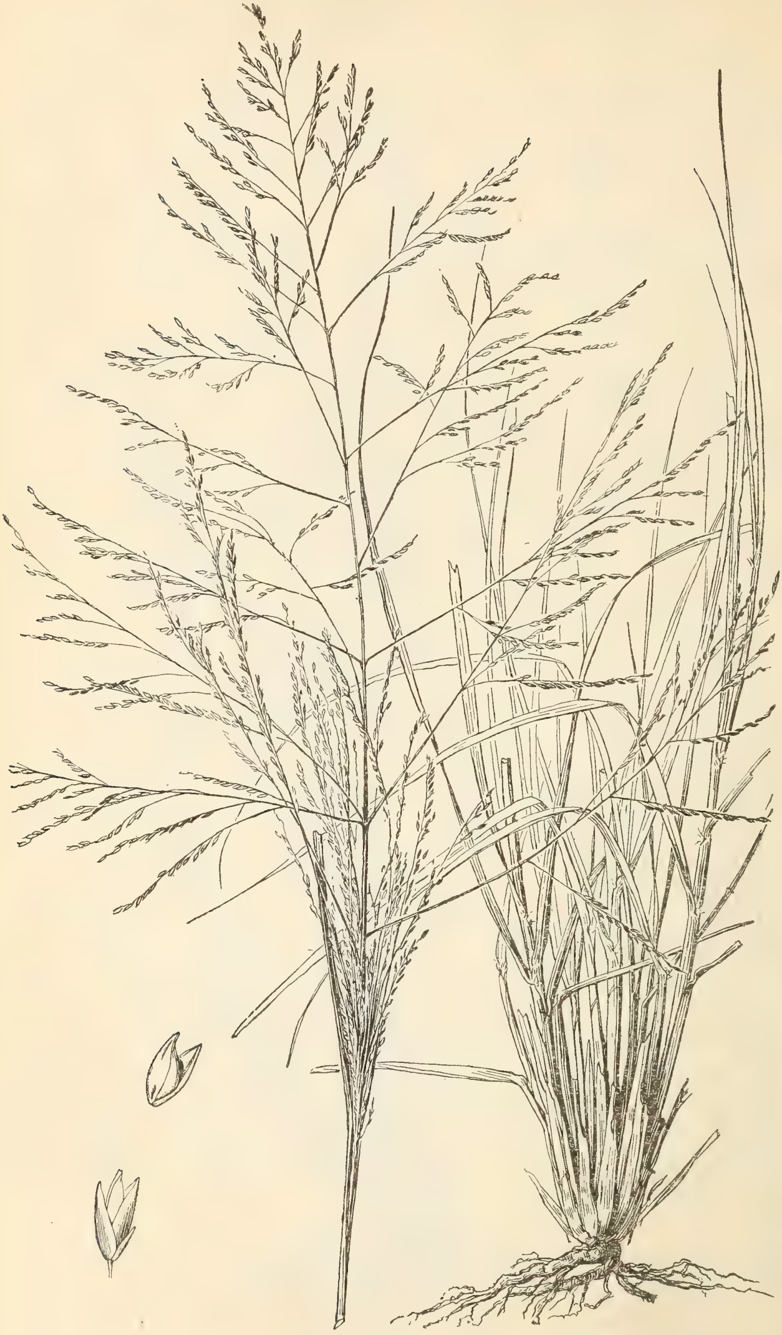

Fig. 86.—Alkali saccaton, *Sporobolus airoides*. Plant, × ½; spikelet and floret, × 5.

The single species (fig. 87) is a tufted grass about a foot high, found on open or rocky soil at middle altitudes from Colorado to central Mexico. It is a palatable grass, sufficiently abundant in places to be of importance. Until recent years the species was included in Sporobolus.

71. Crypsis Ait.

Spikelets 1-flowered, the rachilla disarticulating below the glumes; glumes about equal, narrow, acute; lemma broad, thin, awnless; palea similar to the lemma, about as long, 2-nerved, readily splitting between the nerves; fruit a utricle, the seed free from the thin pericarp.

A spreading annual, with capitate inflorescences in the axils of broad bracts, these being enlarged sheaths with short rigid blades. Species one, in the Mediterranean region; sparingly introduced into the United States.

Type species: *Schoenus aculeatus* L.

Crypsis Ait., Hort. Kew. **1**: 48. 1789. A single species is mentioned, with two varieties or forms, α (the equivalent of the species), based on *Schoenus aculeatus* L., and β, based on *Phleum schoenoides* L. The first is the type.

Bentham and Hooker[1] state that the spikelet has four glumes and no palea. Hackel[2] states that the palea is 1-nerved. Our specimens show an evidently 2-nerved palea.

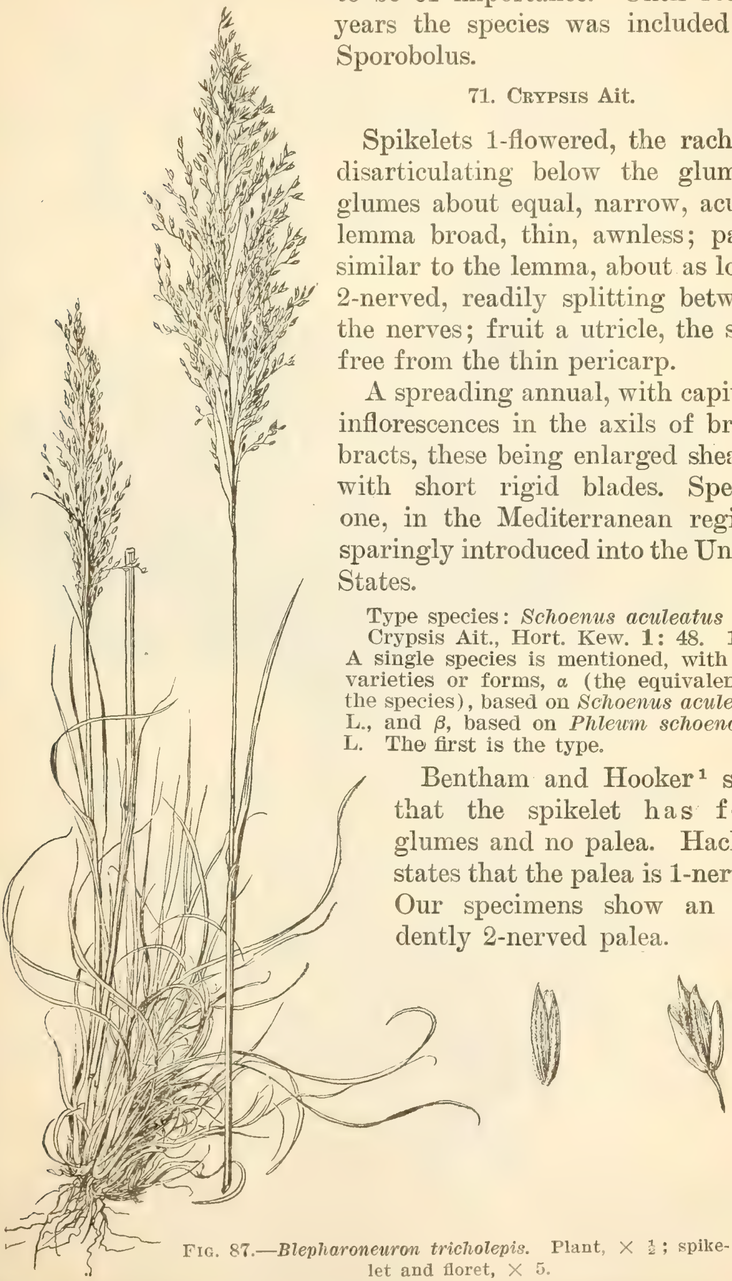

Fig. 87.—*Blepharoneuron tricholepis.* Plant, × ½; spikelet and floret, × 5.

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[1] Gen. Pl. **3**: 1139. 1883.

[2] Engl. and Prantl, Pflanzenfam. 2²: 48. 1887.

Crypsis aculeata (L.) Ait. (fig. 88) has been introduced in a few places in California.

72. Heleochloa Host.

Spikelets 1-flowered, the rachilla disarticulating above the glumes; glumes about equal, narrow, acute; lemma broader, thin, a little longer than the glumes; palea nearly as long as the lemma, 2-nerved, readily splitting between the nerves; caryopsis free from the lemma and palea.

Low perennial spreading grasses, with oblong, dense, spikelike panicles, terminal and on short lateral branches, the subtending leaves with inflated sheaths and reduced blades. Species about seven, in the Mediterranean region, one introduced into the United States.

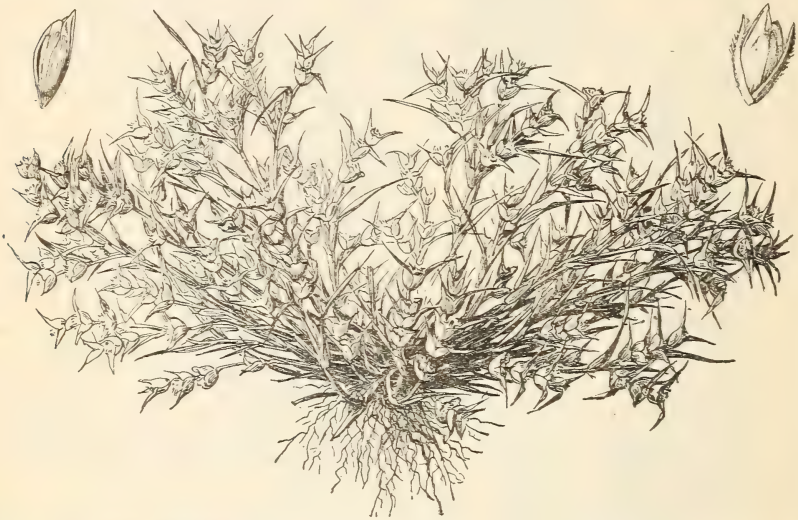

FIG. 88.—*Crypsis aculeata.* Plant, × ½; spikelet and floret, the palea splitting, × 5.

Type species: *Heleochloa alopecuroides* Host.

Heleochloa Host, Gram. Austr. 1: 23. 1801. Two species are described, *H. alopecuroides* and *H. schoenoides*, both of which are figured. The first is chosen as the type.

Heleochloa schoenoides (L.) Host (fig. 89) has been introduced into the eastern United States at several points from Massachusetts and Delaware to Illinois.

73. Brachyelytrum Beauv.

Spikelets 1-flowered, the rachilla disarticulating above the glumes, prolonged behind the palea as a slender naked bristle; glumes very short, unequal, the first sometimes obsolete, the second sometimes awned; lemma firm, narrow, 5-nerved, the base extending into a pronounced oblique callus, the apex terminating in a long straight scabrous awn.

Perennial erect, slender grasses, with short knotty rhizomes, flat blades and narrow, rather few-flowered panicles. Species one, North American.

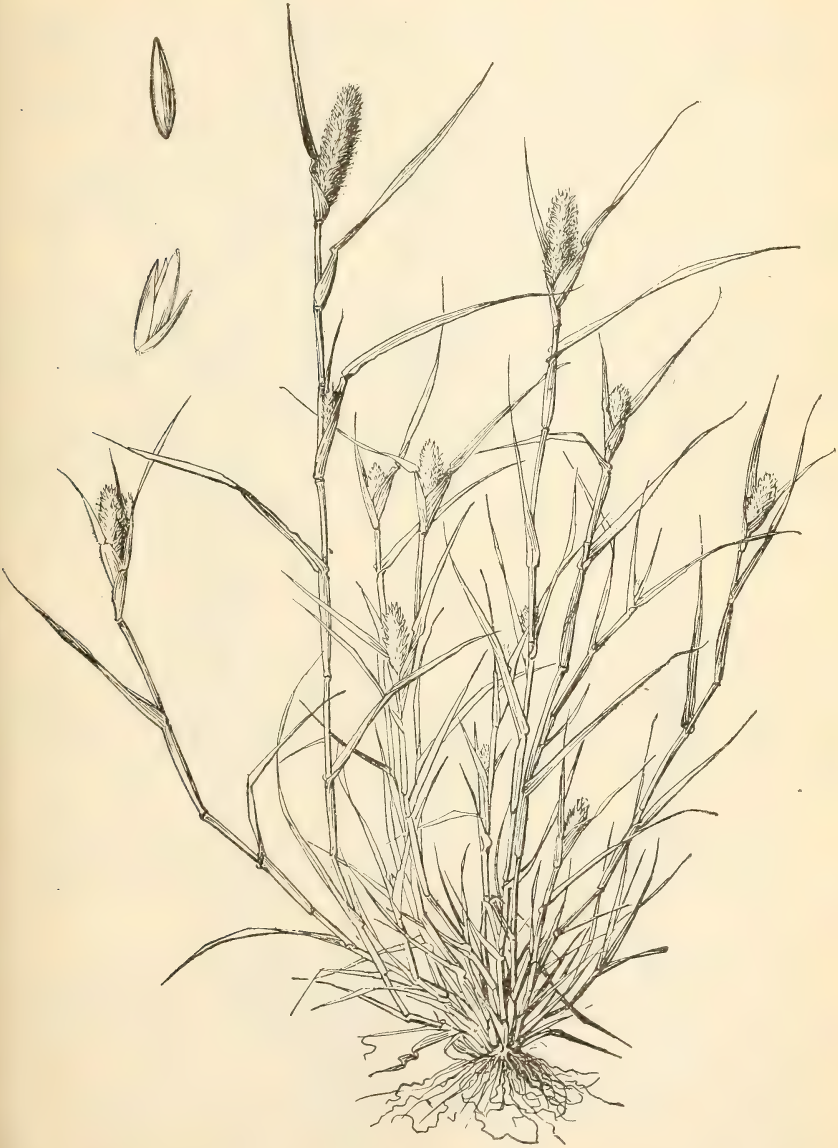

Fig. 89.—*Heleochloa schoenoides.* Plant, × ½ ; spikelet and floret, the palea splitting, × 5.

Type species: *Muhlenbergia erecta* Schreb.

Brachyelytrum Beauv., Ess. Agrost. 39, pl. 9, f. 2. 1812. The type is the figured species, *B. erectum*, based on *Muhlenbergia erecta.*

Brachyelytrum erectum (Schreb.) Beauv. (fig. 90), found in rich rocky woods in the northeastern quarter of the United States, is of no economic importance. It has been known also as *B. aristatum* Beauv.

74. MILIUM L.

Spikelets 1-flowered, disarticulating above the glumes; glumes equal, obtuse, membranaceous, rounded on the back; lemma a little shorter than the glumes, obtuse, awnless, obscurely nerved, rounded on the back, dorsally compressed, in fruit becoming indurate, smooth, and shining, the margins inclosing the lemma, as in Panicum.

Moderately tall grasses with flat blades and open panicles. Species about six, in the cooler parts of Eurasia, one of which is found also in northeastern North America.

Type species: *Milium effusum* L.

Milium L., Sp. Pl. 61. 1753; Gen. Pl., ed. 5. 30. 1754. Two species are described, *M. effusum* and *M. confertum*. The first species is chosen as the type as it was the one best known to Linnæus, being described in his flora of Sweden. The second species is now reduced to a variety of *M. effusum*. Milium is an ancient Latin name for the common millet of Europe (*Panicum miliaceum* L.). Linnæus applied this name to the genus above described.[1]

Milium effusum L. (fig. 91), millet grass, the only representative of the genus in America, is a slender erect perennial 3 to 4 feet tall, found in cool woods from Nova Scotia to Illinois. It is of no economic importance.

75. ORYZOPSIS Michx.

Spikelets 1-flowered, disarticulating above the glumes; glumes about equal, obtuse or acuminate; lemma indurate, usually about as long as the glumes, broad, oval or oblong, nearly terete, usually pubescent, with a short, blunt, oblique callus, and a short, deciduous, sometimes bent and twisted awn; palea inclosed by the edges of the lemma.

Perennial, mostly low grasses, with flat or often involute blades and terminal narrow or open panicles. Species about 20, in the north temperate regions of both hemispheres; 13 species in the United States.

Type species: *Oryzopsis asperifolia* Michx. (fig. 92).

Oryzopsis Michx., Fl. Bor. Amer. 1: 51. 1803. A single species described.

Dilepyrum Raf., Med. Repos. 5: 351. 1808. Rafinesque here announces a new work and gives the names of several proposed new genera and species. One of these is "Dilepyrum, the Orizopsis of do [Michaux]." The type, then, is *Oryzopsis asperifolia* Michx.

Piptatherum Beauv., Ess. Agrost. 17. pl. 5, f. 10. 1812. Beauvois mentions five species and figures two, *P. coerulescens* and *P. punctatum*. *Milium coerulescens*, the basis of the first species, is chosen as the type.

Eriocoma Nutt., Gen. Pl. 1: 40. 1818. The type is *E. cuspidata* Nutt., the only species described. This is the same as *Oryzopsis hymenoides*.

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[1] For a discussion of Milium and Panicum, see Hitchcock and Chase, Contr. U. S. Nat. Herb. 15: 11. 1910.

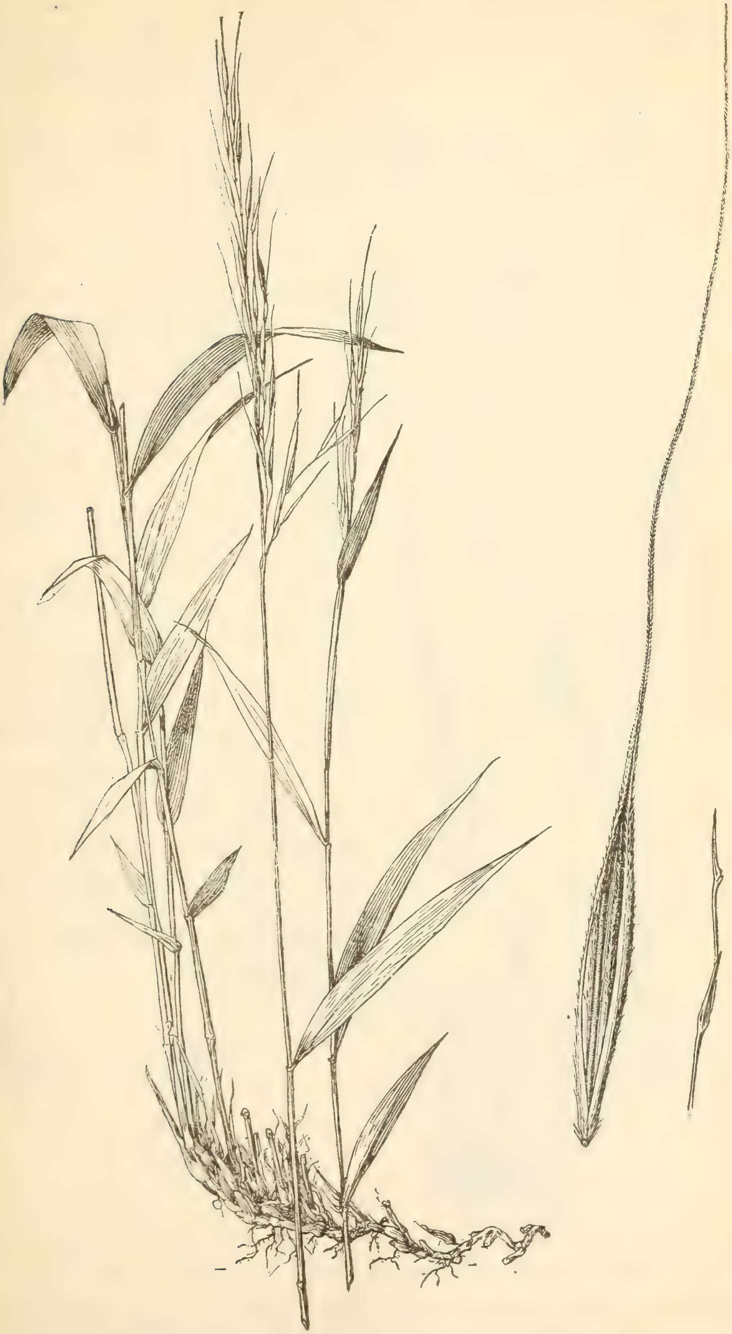

FIG. 90.—*Brachyelytrum erectum.* Plant, × ½; branchlet, with glumes of two spikelets, and floret, × 5.

Urachne Trin., Fund. Agrost. 109. 1820. Trinius cites Beauvois's two figures mentioned above, which represent *Piptatherum coerulescens* and *P. punctatum*, and at the end of his generic description lists three species, *U. coerulescens* (*Milium coerulescens* Desf.), *U. virescens* (*Milium paradoxum* Scop.), and *U. parviflora* (*Agrostis miliacea* L.). The first of these is chosen as the type.

Fendlera Steud., Syn. Pl. Glum. **1**: 419. 1854. Type, *F. rhynchelytroides* Steud., the only species described. This is the same as *Oryzopsis hymenoides.*

The commonest species is *Oryzopsis hymenoides* (Roem. and Schult.) Ricker, found throughout the region west of the Rocky Mountains on dry soil. This has an open divaricate panicle and densely long-silky lemmas. The species of Oryzopsis are grazed by stock, but usually are not in sufficient abundance to be of importance, except Indian mountain rice (*O. hymenoides*).

The allied Mexican and South American genera, Nasella Desv. and Piptochaetium Presl, differ in having an obliquely obovate fertile lemma, the apex gibbous, and the awn eccentrically attached.

76. Stipa L., the spear-grasses.

Spikelets 1-flowered, disarticulating above the glumes, the articulation oblique, leaving a bearded, sharp-pointed callus attached to the base of the floret; glumes membranaceous, often papery, acute, acuminate or even aristate, usually long and narrow; lemma narrow, terete, firm or indurate, strongly convolute, terminating in a usually bent and twisted, prominent, persistent awn; palea inclosed in the convolute lemma.

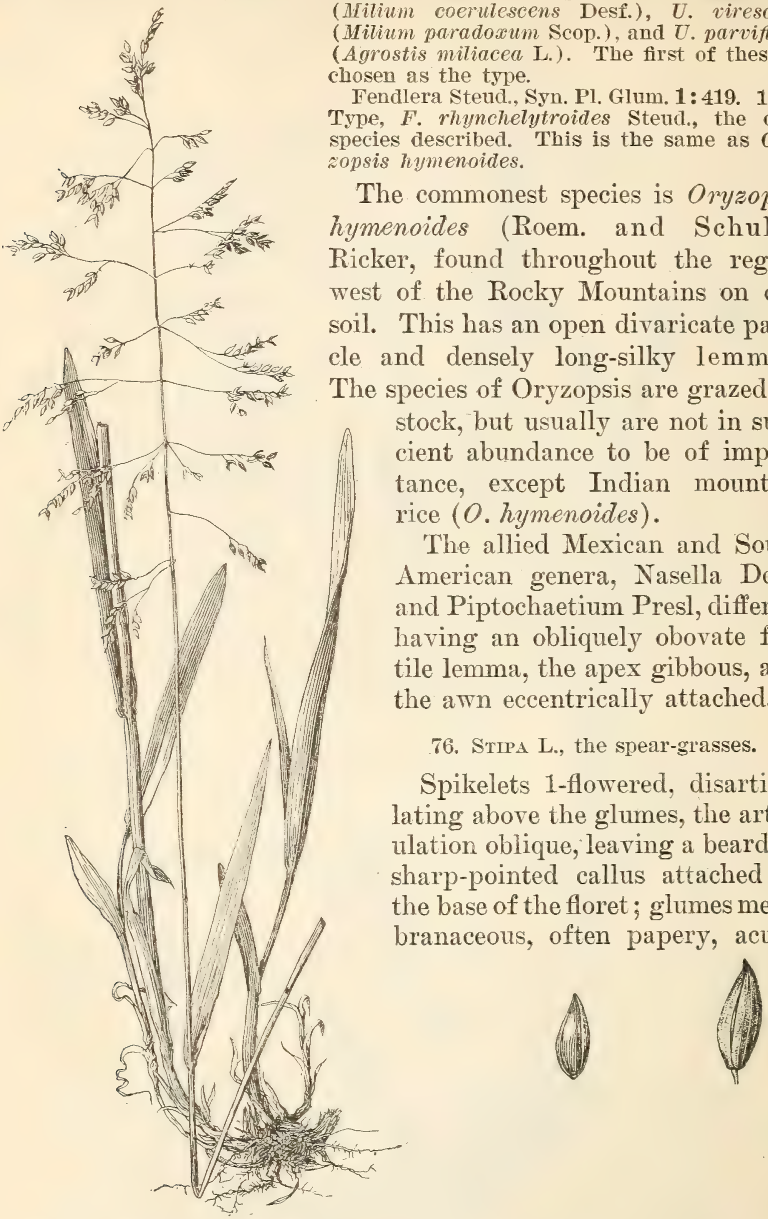

Fig. 91.—Millet grass, *Milium effusum.* Plant, × ½; spikelet and floret, × 5.

Perennial grasses, with usually convolute blades and narrow panicles. Species about 100, in the temperate regions of the world, especially on plains and steppes; 30 species in the United States, mostly in the western part.

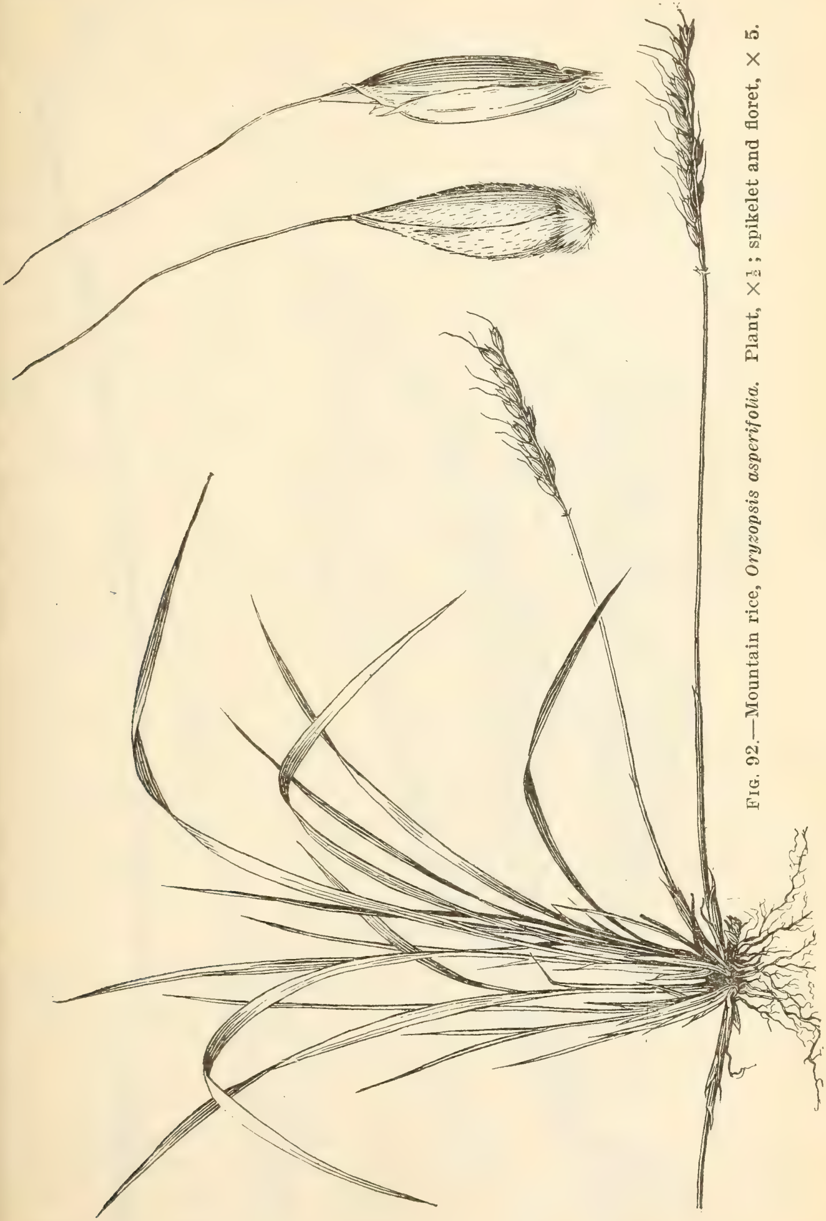

FIG. 92.—Mountain rice, *Oryzopsis asperifolia*. Plant, × $\frac{1}{2}$; spikelet and floret, × 5.

Type species: *Stipa pennata* L.

Stipa L., Sp. Pl. 78, 1753; Gen. Pl., ed. 5, 34. 1754. Linnæus describes three species, *S. pennata*, *S. juncea*, and *S. avenacea*. The first two are from central and southern Europe, the third from Virginia. The first species is selected as the type.

Podopogon Raf., Neogenyt. 4. 1825. Two names are given, "*Stipa avenacea*" L. and "*barbata*" Michx., both belonging to the same species.

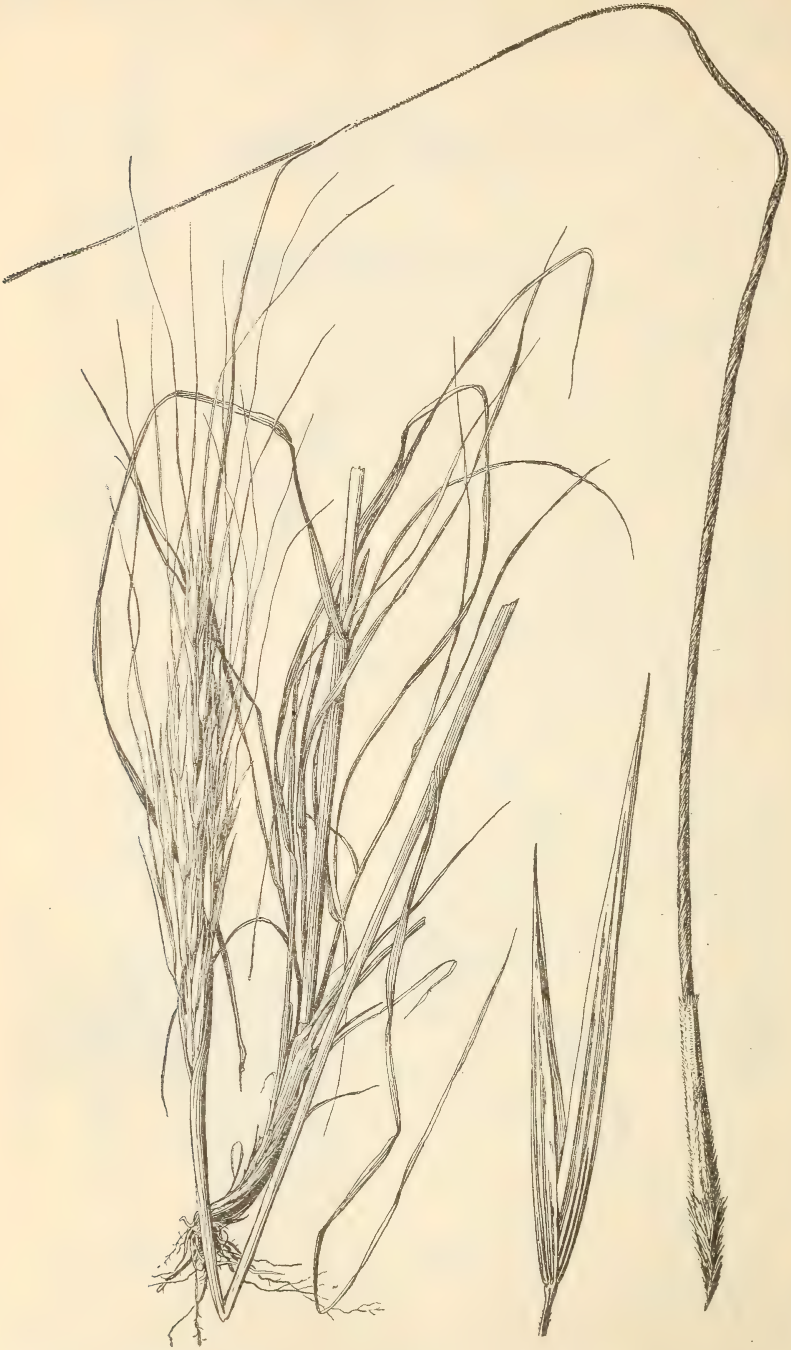

FIG. 93.—Porcupine grass, *Stipa spartea.* Plant, × ½; glumes and floret, × 2.

Some of the western species have plumose or feathery awns, those of *Stipa neo-mexicana* (Thurb.) Scribn. being 4 to 8 inches long, plumose to the second bend, those of the handsome *S. speciosa* Trin. and Rupr. plumose below the single bend. A striking species of the upper Mississippi Valley is *Stipa spartea* Trin. (fig. 93), called porcupine grass and devil's darning needles. The rigid indurate fruiting lemma is about three-fourths of an inch long, tapering below into a very sharp hairy point, which acts like a barb, and terminating above in a stout awn as much as 6 inches long. At maturity the awn bends twice near the middle and becomes tightly twisted below the first bend. Variations in moisture cause the awn to twist and untwist, by which movement and by the aid of the sharp callus it can penetrate the soil. Several other species have elongate awns, such as *S. avenacea* L. of the eastern half of the United States and *S. comata* Trin. and Rupr. of the western half, the latter species being called needle-and-thread grass, because of the long flexuous upper portion of the awns. *Stipa viridula* Trin. and its allies have a narrow compact panicle and comparatively inconspicuous awns 1 or 2 inches long. One of these species, *S. vaseyi* Scribn., is called sleepy grass, because of the narcotic effects sometimes produced upon horses when they have fed upon it. Sleepy grass, found in New Mexico and Colorado, is a stout grass 3 to 5 feet high, with a narrow panicle as much as a foot long, the sheaths hairy at the throat. In *S. tenuissima* Trin. (fig. 94) of New Mexico the fruit is very small, less than 3 mm. long.

The species of Stipa are for the most part valuable forage plants. The most important species on the ranges are *S. viridula*, *S. minor* (Vasey) Scribn., and *S. lettermani* Vasey. They are known as porcupine grasses. All have narrow panicles. One of the Old World species, *S. tenacissima* L., furnishes a part of the esparto or alfa grass of Spain and Algeria that is used in the manufacture of paper and cordage.

77. ARISTIDA L., the needle grasses.

Spikelets 1-flowered, the rachilla disarticulating obliquely above the glumes; glumes equal or unequal, narrow, acute, acuminate, or awn-tipped; lemma indurate, narrow, terete, convolute, with a hard, sharp-pointed, usually minutely bearded callus at base, terminating above in a usually trifid awn.

Annual or perennial, mostly low grasses, with narrow, frequently convolute blades and narrow or sometimes open panicles. Species about 150, in the warmer regions of the world; 36 species in the United States; especially abundant in the Southwestern States.

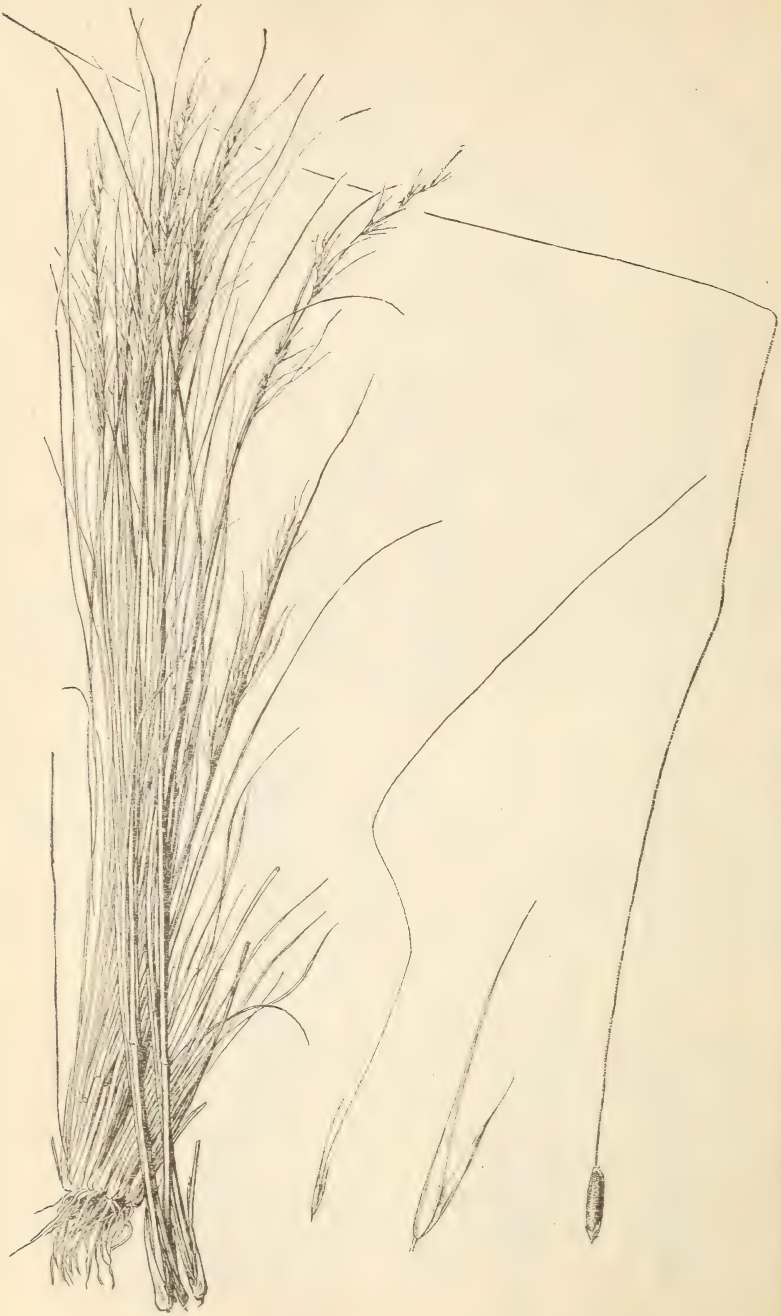

FIG. 94.—*Stipa tenuissima.* Plant, × ½; spikelet, × 2; glumes and floret, × 5.

Type species: *Aristida adscensionis* L.

Aristida L., Sp. Pl. 82, 1753; Gen. Pl., ed. 5, 35. 1754. A single species is described.

Streptachne R. Br., Prodr. Fl. Nov. Holl. 174. 1810. A single species, *S. stipoides*, is included. In this the lateral awns are obsolete.

Chaetaria Beauv., Ess. Agrost. 30, pl. 8, f. 5, 6. 1812. Twenty-five species are listed, two, *C. stricta* (based on *Aristida stricta* Michx.) and *C. capillaris*, are illustrated. *Aristida stricta* (fig. 5) is taken as the type.

Curtopogon Beauv., Ess. Agrost. 32, 159, pl. 8, f. 7. 1812. The only species included is based on *Aristida dichotoma* L.

Trixostis Raf., Bull. Bot. Seringe 1: 221. 1830. A single species, "*Aristida gracilis*" [Ell.], is included.

Moulinsia Raf., Bull. Bot. Seringe 1: 221. 1830. A single species, "*Aristida lanosa*" Muhl., is included.

Ortachne Nees, in Seeman, Bot. Voy. Herald 225. 1857. A single species, based on *Streptachne pilosa* H. B. K., is included.

In one group of the genus the lateral awns are reduced to mere points or are entirely absent. Two species of this group (section Streptachne) are found in Arizona, *Aristida scabra* (H. B. K.) Kunth, with a curved but not twisted awn, and *A. schiedeana* Trin. and Rupr., with a twisted awn. The former is found also in southern Florida. In three species the awn is articulate at base, *A. desmantha* Trin. and Rupr., with short neck, *A. tuberculosa* Nutt., an annual with a slender, twisted neck, and *A. californica* Thurb., a perennial with a slender, twisted neck. *Aristida dichotoma* Michx., a small annual with a coiled central awn, is common in the Eastern States. Two other annuals are common in the eastern part of our country, *A. gracilis* Ell., with the central spreading or reflexed awn less than half an inch long, and *A. oligantha* Michx. (fig. 95), with awns 2 or 3 inches long. The type species, *A. adscensionis* L. (*A. bromoides* H. B. K.), has a wide distribution in warm countries and extends into the southwestern United States. This is a low annual, usually much branched at base, with contracted panicle, the first glume about half as long as the second, and awns about one-third of an inch long. A common perennial species in the semiarid regions of the West is *A. longiseta* Steud., called dog-town grass, because it is especially abundant on the new soil of prairie-dog communities. *Aristida fendleriana* Steud. is an allied species of the same region. The first has a long second glume, about four-fifths of an inch long, and awns as much as 3 or 4 inches long. The second has a shorter second glume, about three-fifths of an inch long, and awns less than 2 inches long, and grows in dense tufts with curly leaves crowded at the base of the plant. *Aristida purpurea* Nutt. differs in having slender curved pedicels. These species are troublesome when the fruit is ripe, because this with its spreading awns becomes detached at maturity and is blown about by the wind. These fruits are sometimes scattered in vast quantities, the wind hurling them across the plains with the sharp-pointed callus in advance. They work their way into the wool of sheep and into the nostrils and eyes of all classes of stock.

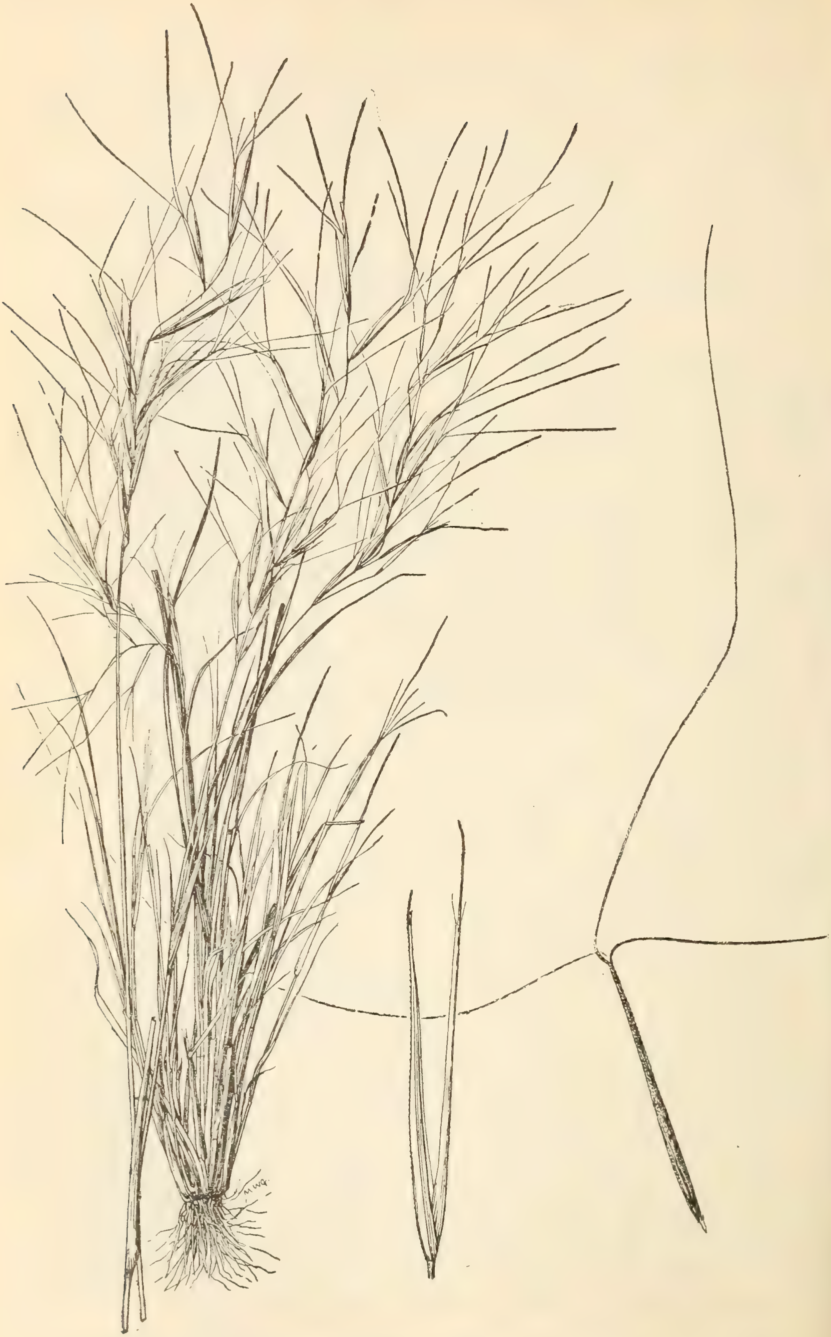

FIG. 95.—Needle grass, *Aristida oligantha.* Plant, × ½; glumes and floret, × 2.

The species of Aristida are of distinctly minor importance for forage except in the Southwest, where several species, such as *A. longiseta*, are eaten by stock before the flowers are produced. The annual species of the Eastern States are often found on open sterile soil, and hence are called poverty grass, a name applied also to annuals of other genera.

6. NAZIEAE, THE CURLY-MESQUITE TRIBE.

78. NAZIA Adans.

(*Tragus* Hall.)

Spikelets 1-flowered, in small spikes of 2 to 5, the spikes subsessile, falling entire, the spikelets sessile on a very short zigzag rachis, the first glumes small, thin, or wanting, appressed to the rachis, the second glumes of the two lower spikelets strongly convex with 3 thick nerves bearing a row of squarrose, stout hooked prickles along each side, the two second glumes forming the halves of a little bur, the upper 1 to 3 spikelets reduced and sterile; lemmas and palea thin, the lemma flat, the palea strongly convex.

Low annual grasses, with flat blades and terminal inflorescence, the burs or spikes rather closely arranged along an elongate, slender axis. Species three, in the tropical regions of both hemispheres; two species being introduced in the southern United States.

Type species: *Cenchrus racemosus* L.

Nazia Adans., Fam. Pl. **2**: 581. 1763. The genus is based on *Cenchrus racemosus* L.

Tragus Hall., Stirp. Helv. **2**: 203. 1768. Haller cites pre-Linnæan authors who connect Tragus with *Cenchrus racemosus* L.

Lappago Schreb., Gen. Pl. 55. 1789. A new name is proposed for Tragus Hall.

Echisachys Neck., Elem. **3**: 228. 1790. No species are given. The author cites "Cenchrus Lin.," but his description shows that it is Linnæus's first species, *Cenchrus racemosus*, that he is renaming.

Nazia racemosa (L.) Kuntze, with 3 to 5 spikelets in each cluster, the lower about 4 mm. long, is found in open ground from Texas to Arizona, and *N. aliena* (Spreng.) Scribn. (fig. 96), with two spikelets in each cluster, the lower 2 to 3 mm. long, here and there through the Southern States to Arizona. They are somewhat weedy grasses of no economic importance.

79. OSTERDAMIA Neck.

(*Zoysia* Willd.)

Spikelets 1-flowered, laterally compressed, appressed flatwise against the slender rachis, glabrous, disarticulating below the glumes; first glume wanting; second glume coriaceous, mucronate, or short-awned, completely infolding the thin lemma and palea, the palea sometimes obsolete.

Perennial low grasses with creeping rhizomes, short, pungently pointed blades, and terminal spikelike racemes, the spikelets on short appressed pedicels. Species about five, southeastern Asia to New Zealand.

Type species: *Agrostis matrella* L.

Osterdamia Neck., Elem. Bot. **3**: 218. 1790. In a note appended to the paragraph on Agrostis, Necker states, "Agrostis matrella Lin. species distincta, agrostidis proxima, quam osterdamiam appellamus, charactere sequenti." Although Osterdamia, Agrostis, Milium, and many other groups are called by Necker species of his genus Achyrophyton, these so-called species are the equivalent of the genera of his contemporaries and are usually so recognized by botanical writers.

Zoysia Willd., Ges. Naturf. Freund. Berlin, Neue Schrift. **3**: 440. 1801. Type and only species, *Z. pungens* Willd.

Matrella Pers., Syn. Pl. **1**: 73. 1805. Type species, *Agrostis juncea* Lam., the only species described.

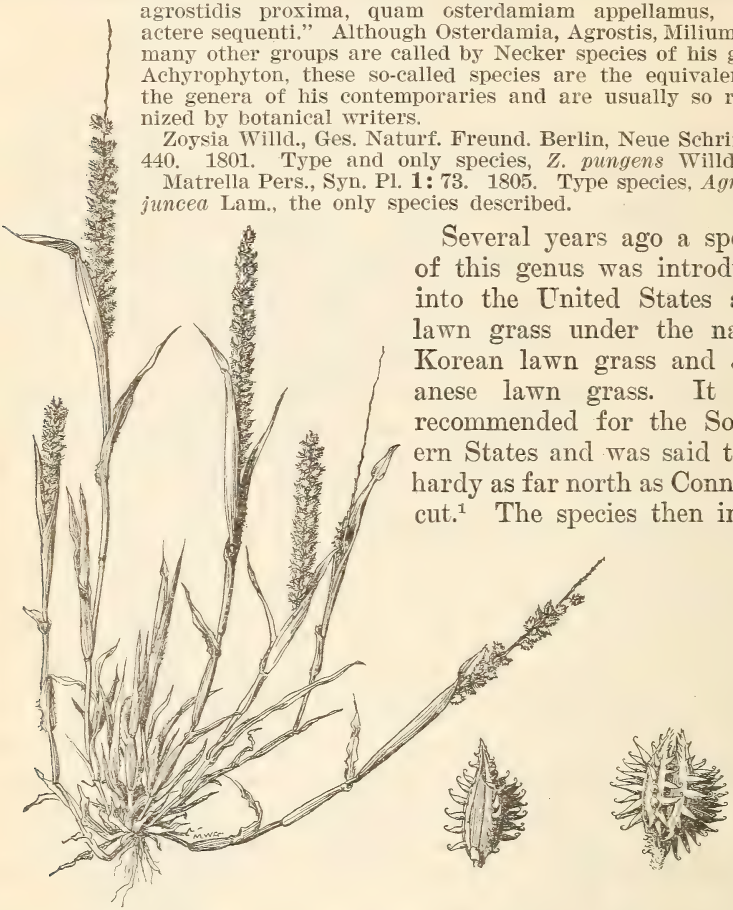

FIG. 96.—*Nazia aliena*. Plant, × ½; group of spikelets (spike) and single spikelet, × 5.

Several years ago a species of this genus was introduced into the United States as a lawn grass under the names Korean lawn grass and Japanese lawn grass. It was recommended for the Southern States and was said to be hardy as far north as Connecticut.[1] The species then introduced appears to be *Osterdamia japonica* (Steud.) Hitchc. (*Zoysia japonica* Steud.). Recently a fine-leaved species, *Osterdamia tenuifolia* (Willd.) Kuntze, has been introduced into Florida and has given favorable results. The original species, *O. matrella* (L.) Kuntze (fig. 97), manila grass, is common in the Philippine Islands.

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[1] Scribner, U. S. Dept. Agr., Div. Agrost. Bull. **3**: 95. 1896.

80. Hilaria H. B. K.

Spikelets sessile, in groups of 3, the groups falling from the axis entire, the central spikelet (next the axis) fertile, 1-flowered, the 2 lateral spikelets staminate, 2-flowered; glumes coriaceous, those of the 3 spikelets forming a false involucre, in some species connate at the base, more or less asymmetric, usually bearing an awn on one side from about the middle; lemma and palea hyaline, about equal in length.

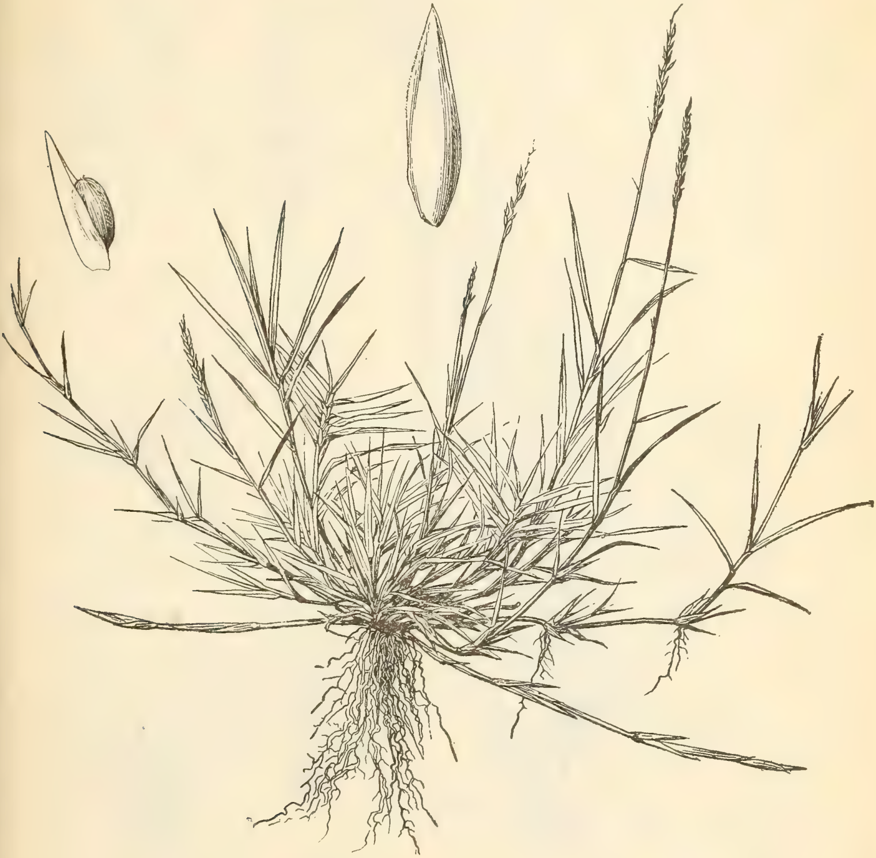

FIG. 97.—Manila grass, *Osterdamia matrella.* Plant, × ½; spikelet, × 10; floret with caryopsis, the palea obsolete, × 10.

Perennial low grasses, the groups of spikelets appressed to the axis, in terminal spikes. Species five, in arid regions, southwestern United States to Central America, all but one found within the limits of the United States.

Type species: *Hilaria cenchroides* **H. B. K.**
Hilaria H. B. K., Nov. Gen. and Sp. 1: 116. 1816. Only one species described.

Pleuraphis Torr., Ann. Lyc. N. Y. **1**: 148, pl. 10. 1824. Type species *P. jamesii* Torr., the only one described.

Hexarrhena Presl, Rel. Haenk. **1**: 326, pl. 45. 1830. Type species *H. cenchroides* Presl, the only one described. This is the same as *Hilaria cenchroides.*

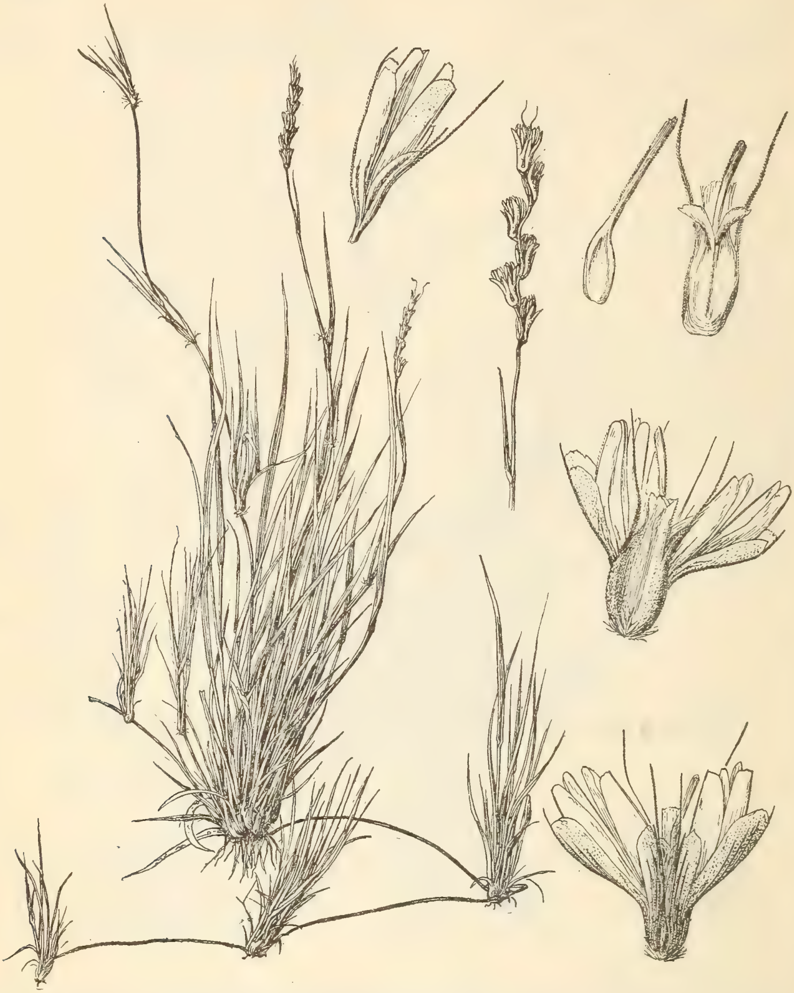

Fig. 98.—Curly mesquite, *Hilaria belangeri.* Plant, × ½; single spike, × 1; group of spikelets seen from front or outside, showing staminate spikelets in front and top of fertile spikelet behind, × 5; same group from behind or next the axis, showing the fertile spikelet in front and the two staminate spikelets behind, × 5; fertile spikelet as seen from the inside, × 5; fertile floret, × 5; staminate spikelet, × 5.

Schleropelta Buckl., Prel. Rep. Geol. and Agr. Surv. Tex. App. 1. 1866. A single species is included, *S. stolonifera* Buckl., which is the same as *Hilaria belangeri* Steud.

Hilaria belangeri Steud. (fig. 98) is a common grass on the Great Plains of Texas and northern Mexico. In Texas it is called curly mesquite. It is a low grass, forming wiry stolons that in favorable soil produce a close, firm sod. The flowering culms are a few inches high and terminate in a short spike. Curly mesquite is an important grazing grass of the uplands of Texas. Our species has commonly been referred to the related, *H. cenchroides*, of Mexico.

Hilaria jamesii (Torr.) Benth. (fig. 99), an erect grass about a foot high, with glumes narrowed above, is found from Wyoming to Texas and southern California. This is called galleta grass in New Mexico. *Hilaria mutica* (Buckl.) Benth., found from Texas to Arizona, differs from the preceding in having some of the glumes broadened above. This species is sometimes called tobosa grass. *Hilaria rigida* (Thurb.) Benth., with felty pubescent branched culms, is found from Utah to southern California. This also is called galleta grass. All the species of Hilaria are important range grasses. The last three species, with scaly rhizomes instead of stolons and with glumes bearing an awn on one side, compose Pleuraphis, held by some as a genus distinct from Hilaria.

81. AEGOPOGON Humb. and Bonpl.

Spikelets short-pedicellate, in groups of 3, the group short-pedunculate, spreading, the peduncle disarticulating from the axis and forming a pointed stipe below the group, this falling entire; central spikelet shorter pedicellate, fertile, the 2 lateral ones longer pedicellate and staminate or neuter; glumes membranaceous, notched at the apex, the midnerve extending into a point or awn; lemma and palea thinner than the glumes, extending beyond them, the lemma 3-nerved, the central nerve and sometimes also the lateral ones extending into awns, the palea 2-awned.

Annual low, lax grasses, with short, narrow, flat blades and loose racemes of delicate flower clusters. Species three, Arizona to Bolivia, one within the United States.

Type species: *Aegopogon cenchroides* Humb. and Bonpl.

Aegopogon Humb. and Bonpl.; Willd. Sp. Pl. **4**: 899. 1806. Only one species is described.

Hymenothecium Lag., Elench. Pl. 7. 1816. In the Elenchus, a list of seeds, occurs *Hymenothecium tenellum* Lag. based on *Cynosurus tenellus* Cav. The genus was published as new by Lagasca in Genera et Species Plantarum, a work appearing in the same year as the preceding but supposed to be somewhat later. In this work (p. 4) four species are given, *H. unisetum*, *H. tenellum*, *H. trisetum* (*Cynosurus gracilis* Cav.), and *H. quinquesetum*. *Cynosurus tenellus* Cav. is accepted as the type.

Schellingia Steud., Flora **33**: 231, pl. 1. 1850. Type, *S. tenera* Steud., the only species described. This is *Aegopogon cenchroides*.

The only species in the United States is *Aegopogon tenellus* (Cav.) Trin. (fig. 100), a Mexican species extending into southern Arizona. It is a pretty little grass, but is of no economic importance.

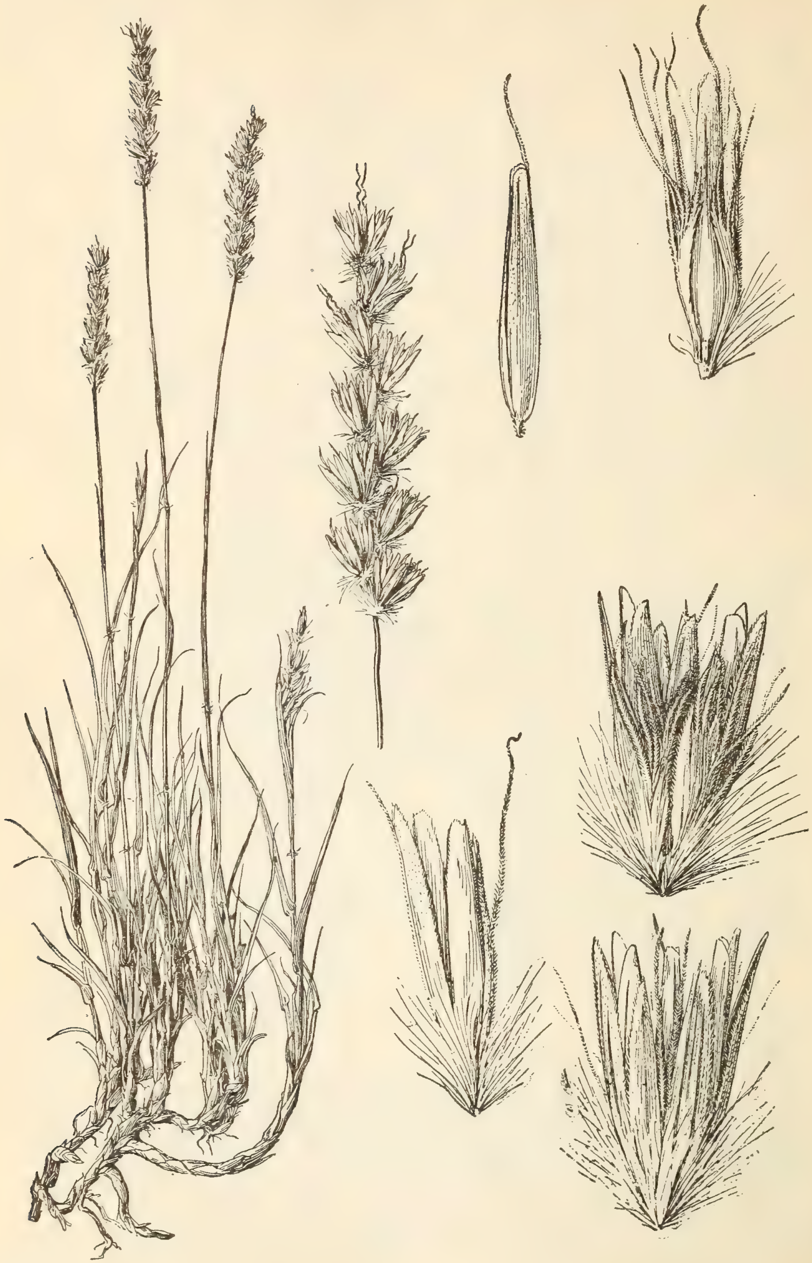

FIG. 99.—Galleta grass, *Hilaria jamesii.* Plant, × ½; single spike, × 1; two views of group of spikelets, the lower a dorsal view, the upper a ventral view, × 5; staminate spikelet (below), × 5; fertile spikelet seen from the inside and fertile floret (above), × 5.

7. CHLORIDEAE, THE GRAMA TRIBE.

82. LEPTOCHLOA Beauv.

Spikelets 2 to several flowered, sessile or short-pediceled, approximate or somewhat distant along one side of a slender rachis, the rachilla disarticulating above the glumes and between the florets; glumes unequal or nearly equal, awnless or mucronate, 1-nerved, usually shorter than the first lemma; lemmas obtuse or acute, sometimes 2-toothed and mucronate or short-awned from between the teeth, 3-nerved, the nerves sometimes pubescent.

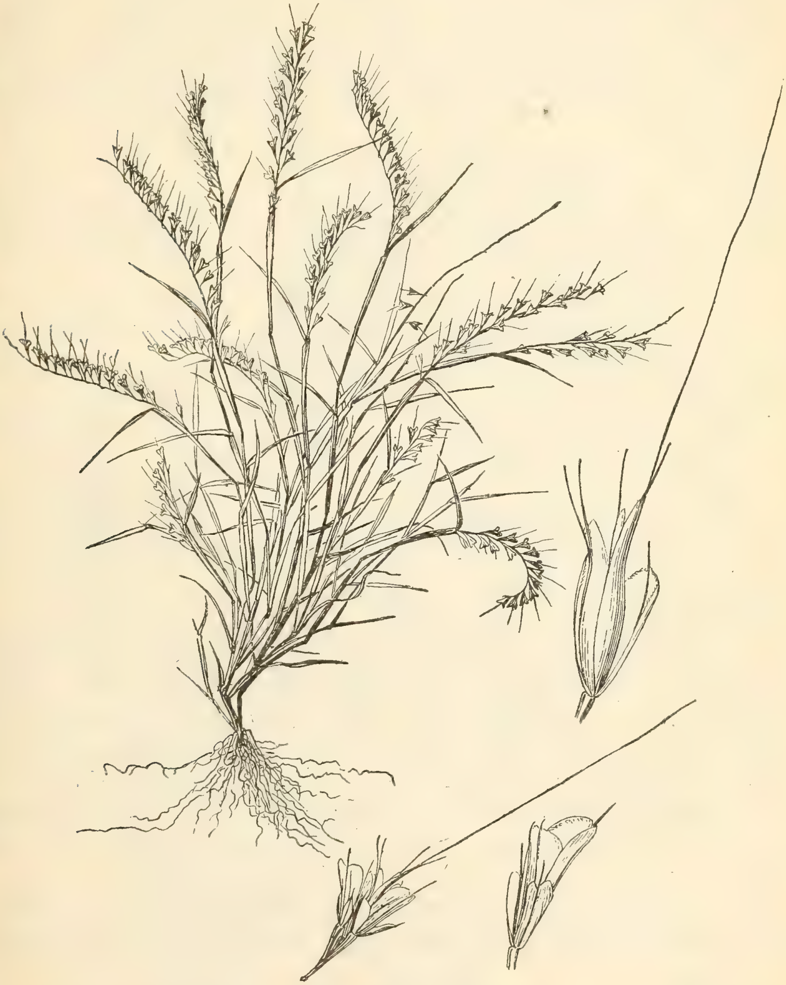

FIG. 100.—*Aegopogon tenellus.* Plant, × ½; group of spikelets, × 5; lateral spikelet, × 10; central (long-awned) spikelet, × 10.

Annual or perennial grasses, with flat blades and numerous spikes or racemes scattered along a common axis forming a long or sometimes short panicle. Species probably 20, in the warmer regions: 10 species in the United States, mostly in the Southern and Southwestern States.

Type species: *Cynosurus virgatus* L.

Leptochloa Beauv., Ess. Agrost. 71, 166, pl. 15, f. 1. 1812. Beauvois includes three species, *Cynosurus capillaceus*, *Eleusine filiformis*, and *E. virgata*, all of which appear in the index under Leptochloa. The third species is figured and hence is selected as the type.

Diplachne Beauv., Ess. Agrost. 80, pl. 16, f. 9. 1812. The type is *Festuca fascicularis* Lam., the only species mentioned. This is figured by Beauvois.

Rabdochloa Beauv., Ess. Agrost. 84, pl. 17, f. 3. 1812. Beauvois includes *Cynosurus monostachyos*, *C. virgatus*, *C. domingensis*, *C. cruciatus*, and *C. mucronatus*, the last two with question. The species figured, *C. domingensis*, in the explanation to the plates called *Rabdochloa domingensis*, is selected as the type.

Oxydenia Nutt., Gen. Pl. **1**: 76. 1818. Only one species included, *O. attenuata*, which is *Leptochloa filiformis*.

Some authors[1] recognize Diplachne as a distinct genus, including *Leptochloa fascicularis*, *L. floribunda*, and *L. dubia*. In this group the spikelets are somewhat pediceled and are less distinctly arranged in one-sided spikes. Those who recognize the genus place it in the tribe Festuceae.

Leptochloa filiformis (Lam.) Beauv. (fig. 101) is an annual with papillate-pilose sheaths, small spikelets, the awnless florets shorter than the glumes, and numerous very slender spikes 3 to 6 inches long arranged in a panicle as much as a foot long. This is a weed in cultivated soil from Virginia to Florida and California; common also in the Tropics; sometimes called red sprangle-top.

Leptochloa fascicularis (Lam.) Gray is a smooth, erect or prostrate annual with several-flowered spikelets, the awned florets longer than the glumes; found in ditches and brackish meadows from Massachusetts to Florida and New Mexico.

The other species are more local. Two perennials, *L. domingensis* (Jacq.) Trin. and *L. virgata* (L.) Beauv., are tropical species which reach the United States in southern Florida and southern Texas, respectively. *Leptochloa dubia* (H. B. K.) Nees, a perennial with comparatively few spikes and broad lemmas notched at the apex, the nerves glabrous (the margin pubescent), is found in Florida and from Texas to New Mexico. In the Southwest it is called sprangle or sprangle-top and Texas crowfoot, and it is important as a forage grass.

For a revision of the species of Leptochloa found in the United States, see Hitchcock, U. S. Dept. Agr., Bur. Pl. Ind. Bull. 33. 1903.

83. TRIPOGON Roth.

Spikelets several-flowered, nearly sessile, and appressed in two rows along one side of a slender rachis, the rachilla disarticulating above the glumes and between the florets; glumes somewhat unequal, acute or acuminate, narrow, 1-nerved; lemmas narrow, 3-nerved,

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[1] Nash in Small, Fl. Southeast. U. S. 145, 1903; in Britt. and Brown, Illustr. Fl., ed. 2, **1**: 236. 1913.

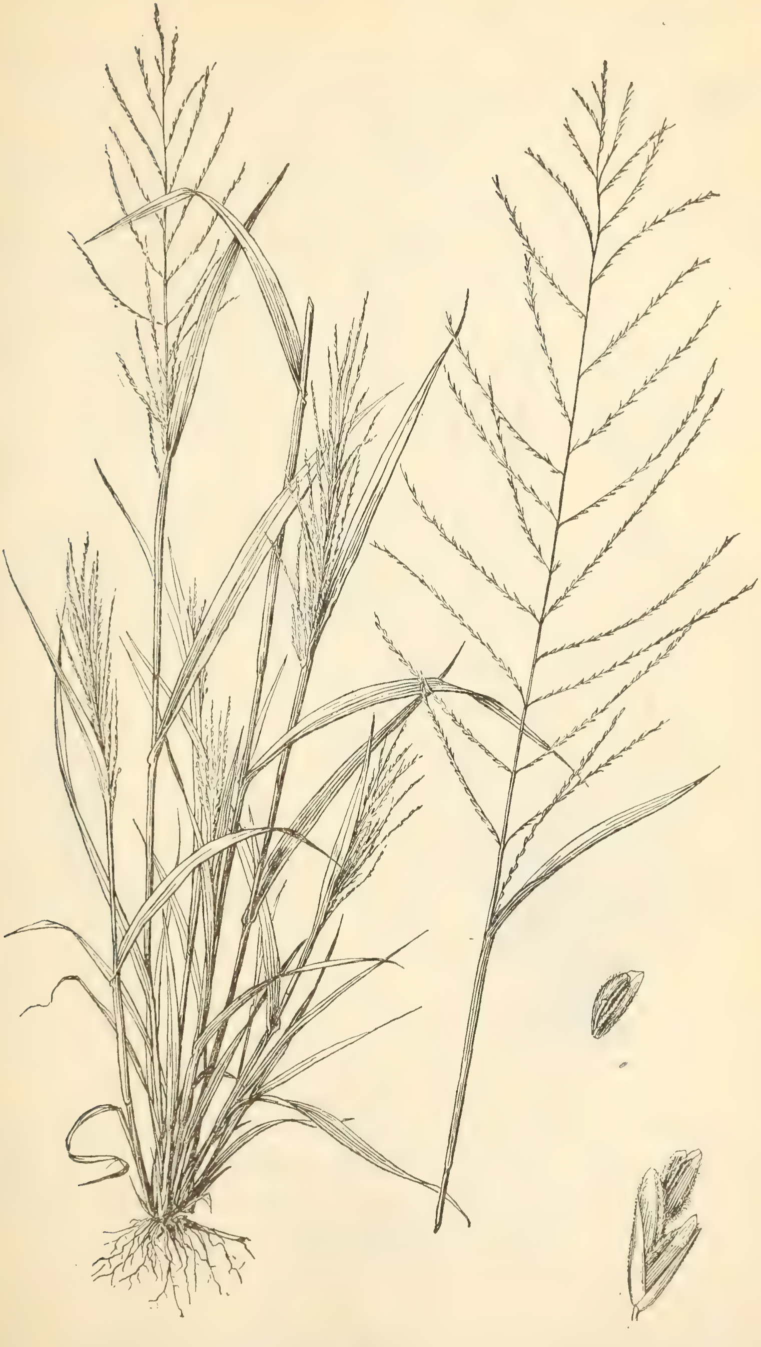

Fig. 101.—Red sprangle-top, *Leptochloa filiformis*. Plant, × ½; spikelet and floret, ×10.

bearing at the base a tuft of long hairs, bifid at the apex, the midnerve extending as a short awn.

Our species is a low, tufted perennial, with capillary blades and slender solitary spikes, the spikelets somewhat distant. Species about nine, East Indian and African except one American.

Type species: *Tripogon bromoides* Roth.

Tripogon Roth; Roem. and Schult., Syst. Veg. **2**: 600. 1817. Only one species described.

The American species, *Tripogon spicatus* (Nees) Ekman (*Leptochloa spicata* Scribn.) (fig. 102), is found on sterile hills in Texas and northern Mexico, Cuba, and South America. It is of no importance agriculturally.

84. Eleusine Gaertn.

Spikelets few to several flowered, compressed, sessile and closely imbricate, in two rows along one side of a rather broad rachis, the latter not prolonged beyond the spikelets; rachilla disarticulating above the glumes and between the florets, glumes unequal, rather broad, acute, 1-nerved, shorter than the first lemma; lemmas acute, with 3 strong green nerves close together forming a keel, the uppermost somewhat reduced; seed dark brown, roughened by fine ridges, loosely inclosed in the thin pericarp.

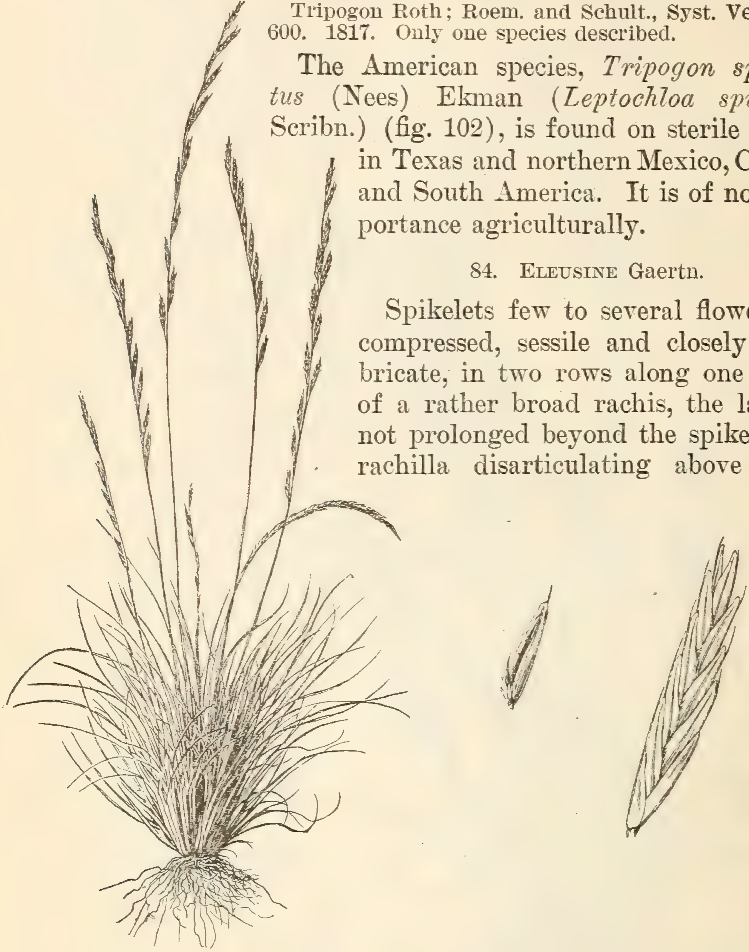

FIG. 102.—*Tripogon spicatus*. Plant, × ½; spikelet and floret, × 5.

Annual grasses, with two to several rather stout spikes, digitate at the summit of the culms, sometimes with one or two a short distance below, or rarely with a single terminal spike. Species about six, in the warm regions of the Eastern Hemisphere, one a common introduced weed in America.

Type species: *Eleusine coracana* Gaertn.
Eleusine Gaertn., Fruct. and Sem. **1**: 7, pl. 1, f. 11. 1788. Two species are described, *E. coracana* and *E. indica*. The first, being figured, is selected as the type.

Eleusine indica (L.) Gaertn. (fig. 103) is a common garden and roadside weed throughout the warmer parts of America, extending northward to Illinois and Massachusetts. It is usually spreading or prostrate, with two to several spikes, or rarely one. This species is sometimes called goose-grass and yard-grass.

The type species of the genus, *Eleusine coracana* Gaertn., is cultivated in the Tropics of the Old World for the seed, which is used for human food by the poor or primitive people. It differs from *E. indica* in its larger size, stouter, often incurved spikes, and globose seed.

85. DACTYLOCTENIUM Willd.

Spikelets 3 to 5 flowered, compressed, sessile and closely imbricate, in two rows along one side of the rather narrow flat rachis, the end projecting in a point beyond the spikelets; rachilla disarticulating above the first glume and between the florets; glumes somewhat unequal, broad, 1-nerved, the first persistent upon the rachis, the second mucronate or short-awned below the tip, deciduous; lemmas firm, broad, keeled, acuminate or short-awned, 3-nerved, the lateral nerves indistinct, the upper floret reduced; the palea about as long as the lemma; seed subglobose, ridged or wrinkled, inclosed in a thin, early-disappearing pericarp.

Annual or perennial grasses, with flat blades and two to several short thick spikes, digitate and widely spreading at the summit of the culms. Species three, in the warmer parts of the Eastern Hemisphere, one a common weed in tropical America.

Type species: *Cynosurus aegyptius* L.
Dactyloctenium Willd., Enum. Pl. 1029. 1809. Willdenow describes but one species, *D. aegyptiacum*, based on *Cynosurus aegyptius* L.

Our only species is *Dactyloctenium aegyptium* (L.) Richt. (*D. aegyptiacum* Willd.) (fig. 104), a tropical weed which extends northward to New York and Illinois. It is a prostrate annual with 2 to 5 spikes, often forming mats rooting at the nodes. Sometimes called crowfoot grass.

86. CAPRIOLA Adans.

(*Cynodon* Rich.)

Spikelets 1-flowered, awnless, sessile in two rows along one side of a slender continuous rachis, the rachilla disarticulating above the glumes and prolonged behind the palea as a slender naked bristle,

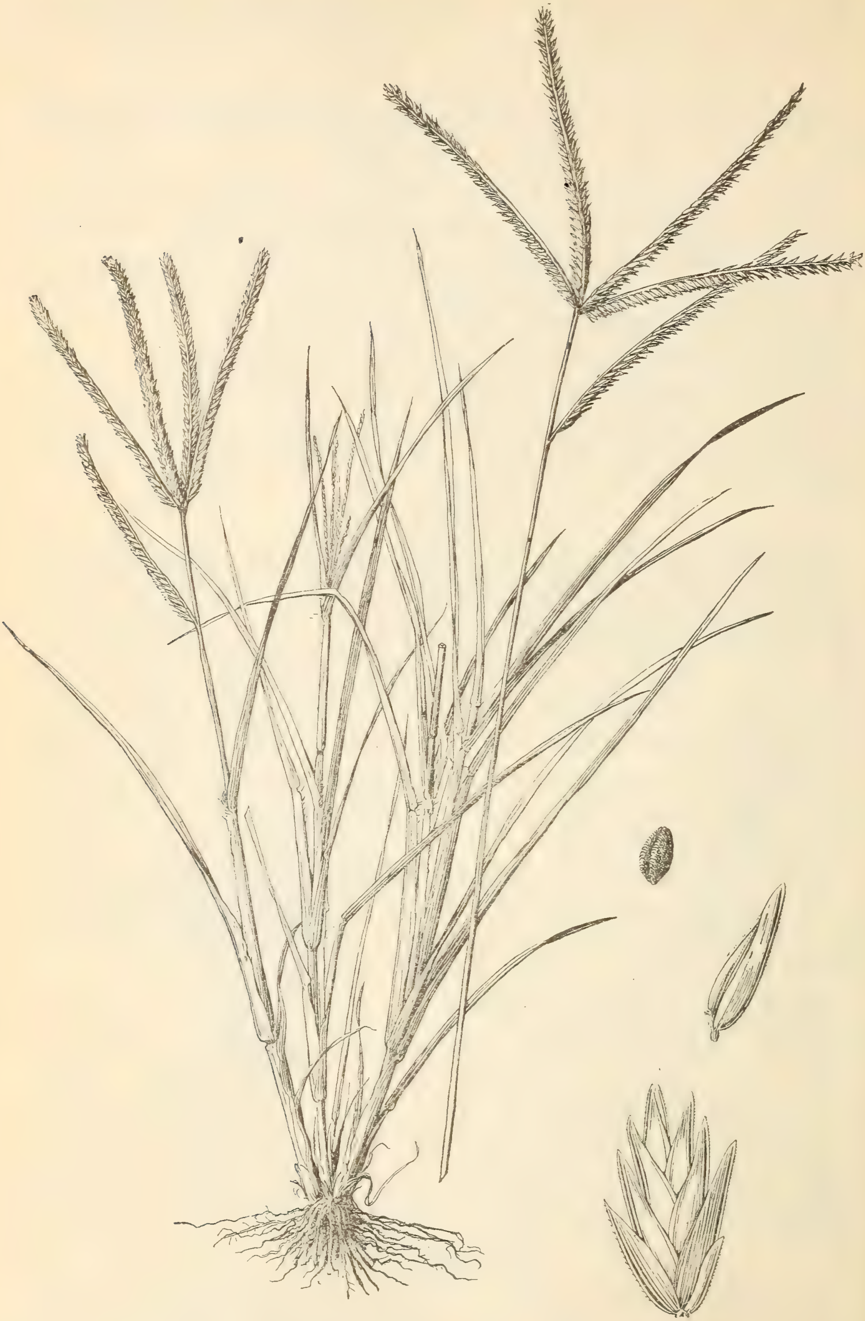

FIG. 103.—Goose-grass, *Eleusine indica*. Plant, × ½; spikelet, floret, and seed (without pericarp), × 5.

this sometimes bearing a rudimentary lemma; glumes narrow, acuminate, 1-nerved, about equal, shorter than the floret; lemma strongly compressed, pubescent on the keel, firm in texture, 3-nerved, the lateral nerves close to the margins.

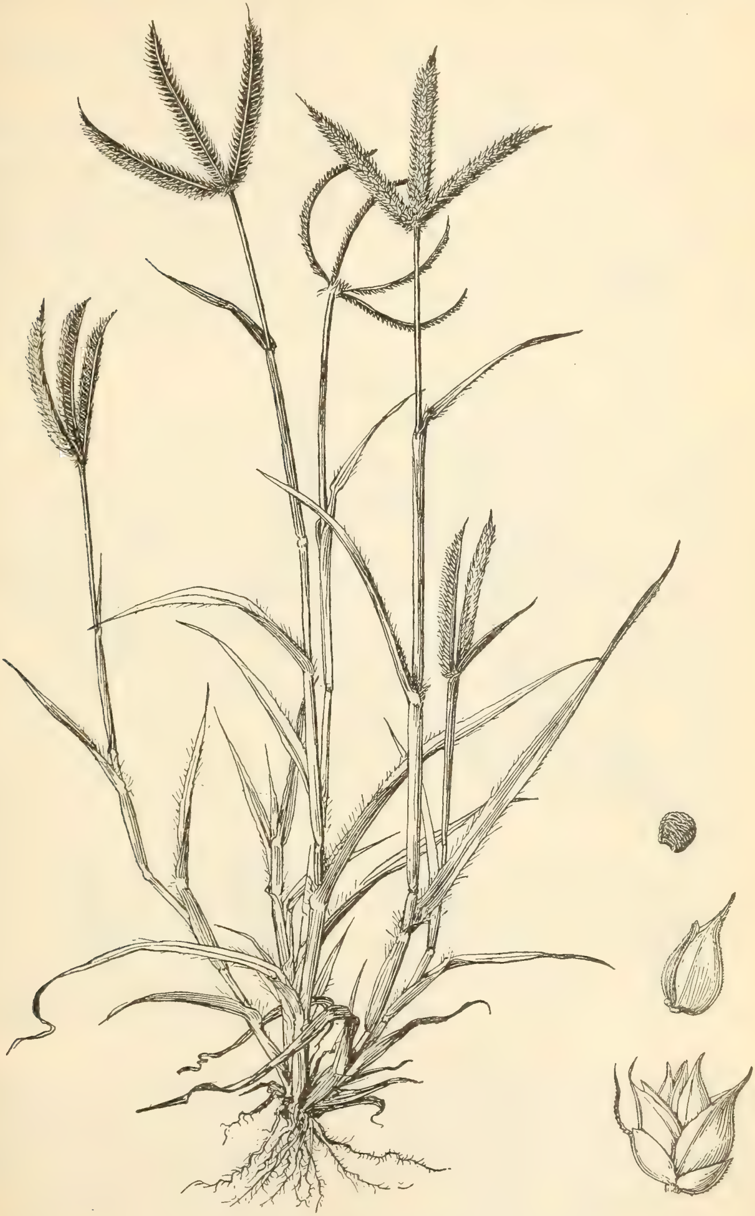

FIG. 104.—Crowfoot grass, *Dactyloctenium aegyptium*. Plant, × ½; spikelet, floret, and seed (without pericarp), × 5.

Perennial, usually low grasses, with creeping stolons or rhizomes, short blades, and several slender spikes digitate at the summit of the upright flowering stems. Species six, of which three are Australian, one species widely distributed in the warmer regions of the globe.

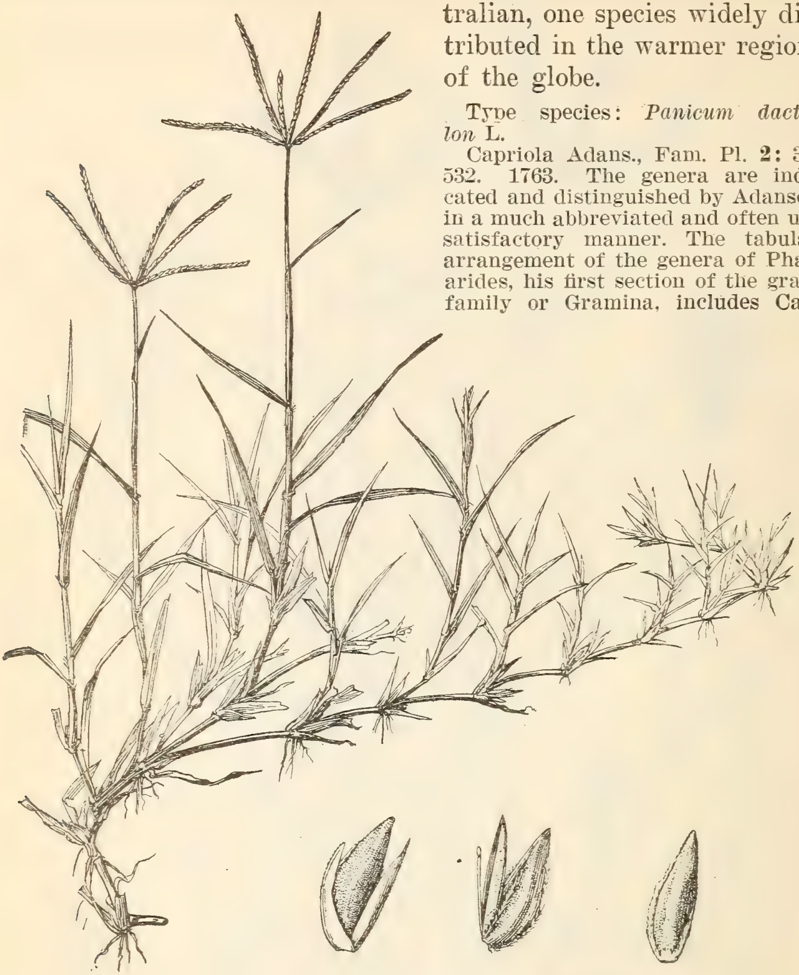

FIG. 105.—Bermuda grass, *Capriola dactylon.* Plant, × ½; spikelet and two views of floret, × 5.

Type species: *Panicum dactylon* L.

Capriola Adans., Fam. Pl. **2:** 31, 532. 1763. The genera are indicated and distinguished by Adanson in a much abbreviated and often unsatisfactory manner. The tabular arrangement of the genera of Phalarides, his first section of the grass family or Gramina, includes Capriola, with the following diagnosis, interpreting the table: Summit of leaf sheath hairy; flowers in digitate spikes; glumes laterally compressed; lemma awnless. In the index there is given as a synonym under Capriola, "Gramen dactylon Offic." The last phrase appears in the first edition of the Species Plantarum[1] in the synonymy under *Panicum dactylon* as "Gramen dactylon, radice repente. s. officinarum. Scheuch. gram. 104," thus connecting Capriola Adans. with *Panicum dactylon.*

Cynodon Rich.; Pers., Syn. Pl. **1:** 85. 1805. Only one species described, *C. dactylon,* based on *Panicum dactylon* L.

The only species in North America is *Capriola dactylon* (L.) Kuntze (fig. 105), commonly known as Bermuda grass. This is a native of the Mediterranean region, but is common in the southern United States, extending north to Maryland, southern Kansas, and the interior valleys of California.

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[1] L., Sp. Pl. 58. 1753.

Bermuda grass is the most important pasture grass of the Southern States, and is also widely utilized there as a lawn grass. On alluvial ground it may grow sufficiently rank to be cut for hay. It propagates readily by its rhizomes and stolons and on this account may become a pestiferous weed in cultivated fields. This grass is known also as wire-grass (especially the weedy form in fields), Bahama grass in the West Indies, and manienie in the Hawaiian Islands.

A larger form, *Capriola dactylon maritima* (H. B. K.) Hitchc. (*Cynodon maritimus* H. B. K.), is found along the seacoast of Florida.

87. WILLKOMMIA Hack.

Spikelets 1-flowered, dorsally compressed, sessile in two rows on one side of a slender rachis and appressed to it, the rachilla somewhat lengthened below and above the second glume, disarticulating just above it, not prolonged above the floret; glumes thin, the first narrow, about two-thirds as long as the second, nerveless, obtuse, the second 1-nerved, subacute; lemma about as long as the second glume, awnless, 3-nerved, the lateral nerves near the margin, the back of the lemma sparingly pubescent between the nerves, the margins densely covered with silky hairs; palea 2-nerved, the nerves densely silky hairy.

Annuals or perennials, with several short spikes scattered along a main axis; our species a low, tufted perennial. Species four; three in South Africa, one in Texas.

Type species: *Willkommia sarmentosa* Hack.

Willkommia Hack., Verh. Bot. Ver. Brandenburg **30**: 145. 1888. Hackel describes two species, *W. sarmentosa*, a perennial, and *W. annua*, an annual, both from German Southwest Africa. The first species is selected as the type.

Willkommia texana Hitchc. (fig. 106), confined to a few localities in Texas, in alkali spots in prairies and openings in woods, has no agricultural importance.

88. SCHEDONNARDUS Steud.

Spikelets 1-flowered, sessile and somewhat distant in two rows on one side of a slender, continuous 3-angled rachis, appressed to its slightly concave sides, the rachilla disarticulating above the glumes, not prolonged; glumes narrow, stiff, somewhat unequal, acuminate, 1-nerved; lemmas narrow, acuminate, a little longer than the glumes, 3-nerved.

A low, tufted perennial, with stiff, slender, divergent spikes arranged rather remotely along a common axis. Species one, on the Great Plains of the United States and in Argentina.

Type species: *Schedonnardus texanus* Steud.

Schedonnardus Steud., Syn. Pl. Glum. **1:** 146. 1854. A single species described, *S. texanus,* based on Drummond's no. 360 from Texas. This is *S. paniculatus* (Nutt.) Trel. (*Lepturus paniculatus* Nutt.).

Spirochloë Lunell, Amer. Midl. Nat. **4:** 220. 1915. Proposed for "Schedonnardus Steud . . . not thought permissible, being built on Nardus."

Schedonnardus paniculatus (fig. 107), the only species of the genus, is found on prairies and plains from Montana and Illinois to Texas. The axis of the inflorescence elongates after flowering, becoming 1 to 2 feet long, curved in a loose spiral. The whole breaks away at maturity and rolls before the wind as a tumbleweed. The species is a forage grass, but the plants are low and in the main form only an inconsiderable proportion of the total forage.

89. Beckmannia Host.

Spikelets 1-flowered, rarely 2-flowered, laterally compressed, subcircular, nearly sessile and closely imbricate, in two rows along one side of a slender continuous rachis, disarticulating below the glumes,

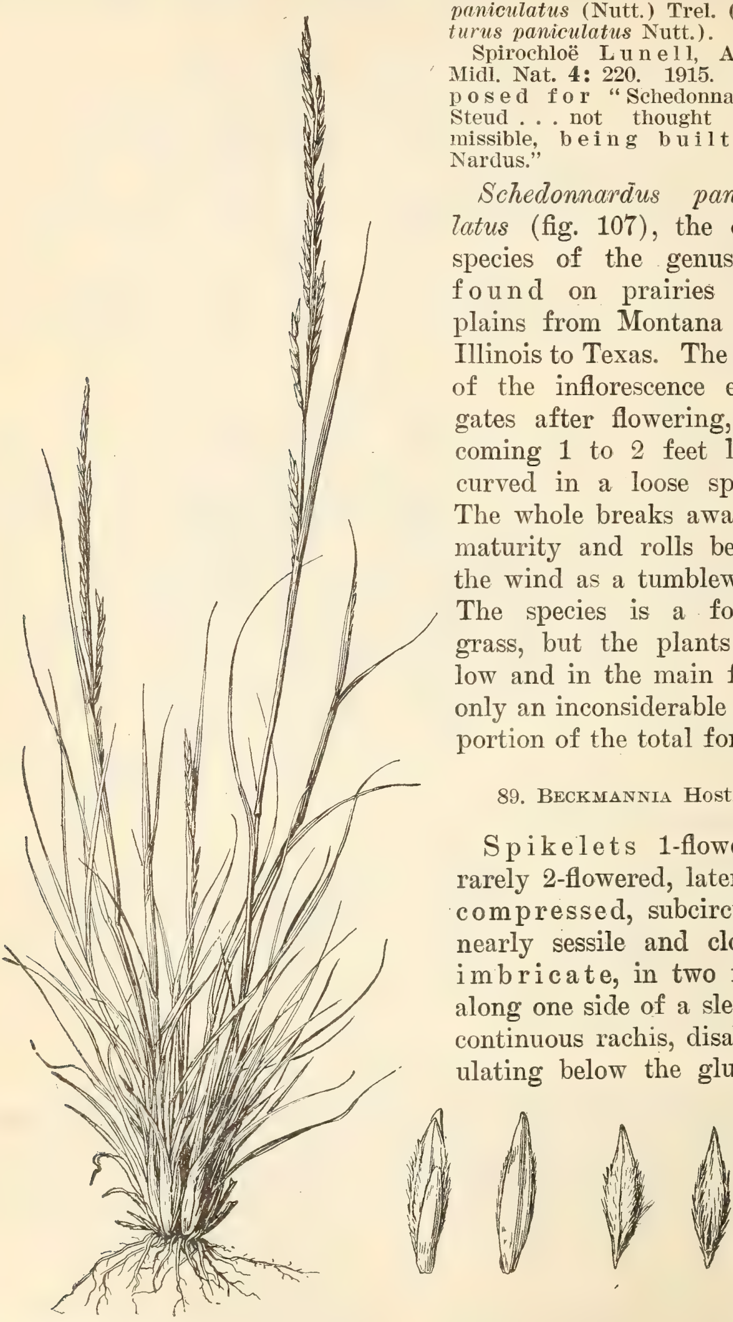

Fig. 106.—*Willkommia texana.* Plant, × ½; two views of spikelet and two views of floret, × 5.

falling entire; glumes equal, inflated, obovate, 3-nerved, rounded above but the apex apiculate; lemma narrow, 5-nerved, acuminate, about as long as the glumes; palea 2-nerved, nearly as long as the lemma.

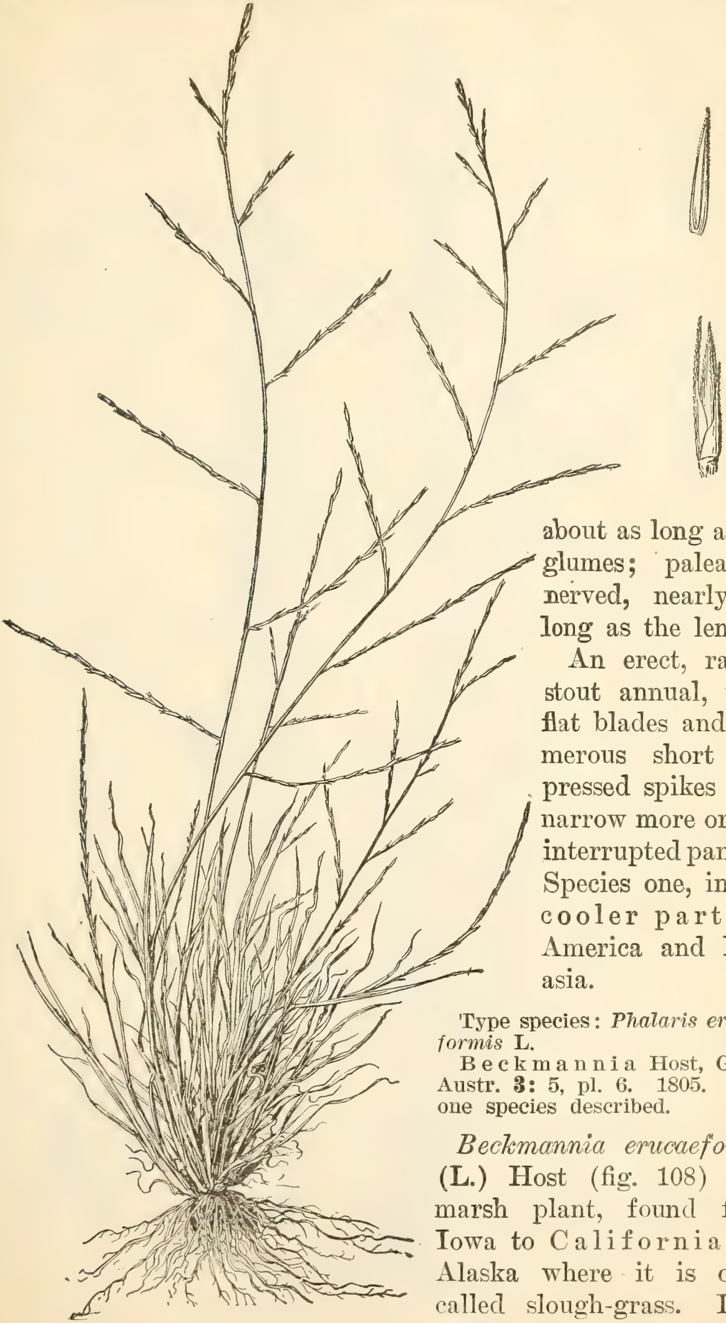

FIG. 107.—*Schedonnardus paniculatus.* Plant, × ½; spikelet and floret, × 5.

An erect, rather stout annual, with flat blades and numerous short appressed spikes in a narrow more or less interrupted panicle. Species one, in the cooler parts of America and Eurasia.

Type species: *Phalaris erucaeformis* L.

Beckmannia Host, Gram. Austr. **3:** 5, pl. 6. 1805. Only one species described.

Beckmannia erucaeformis **(L.)** Host (fig. 108) is a marsh plant, found from Iowa to California and Alaska where it is often called slough-grass. It is palatable to stock, is sometimes sufficiently abundant locally to be an important forage grass, and is not infrequently used for hay. The European form has 2-flowered spikelets.

90. Spartina Schreb.

Spikelets 1-flowered, much flattened laterally, sessile and usually closely imbricate, on one side of a continuous rachis, disarticulating below the glumes, the rachilla not produced beyond the floret; glumes keeled, 1-nerved,

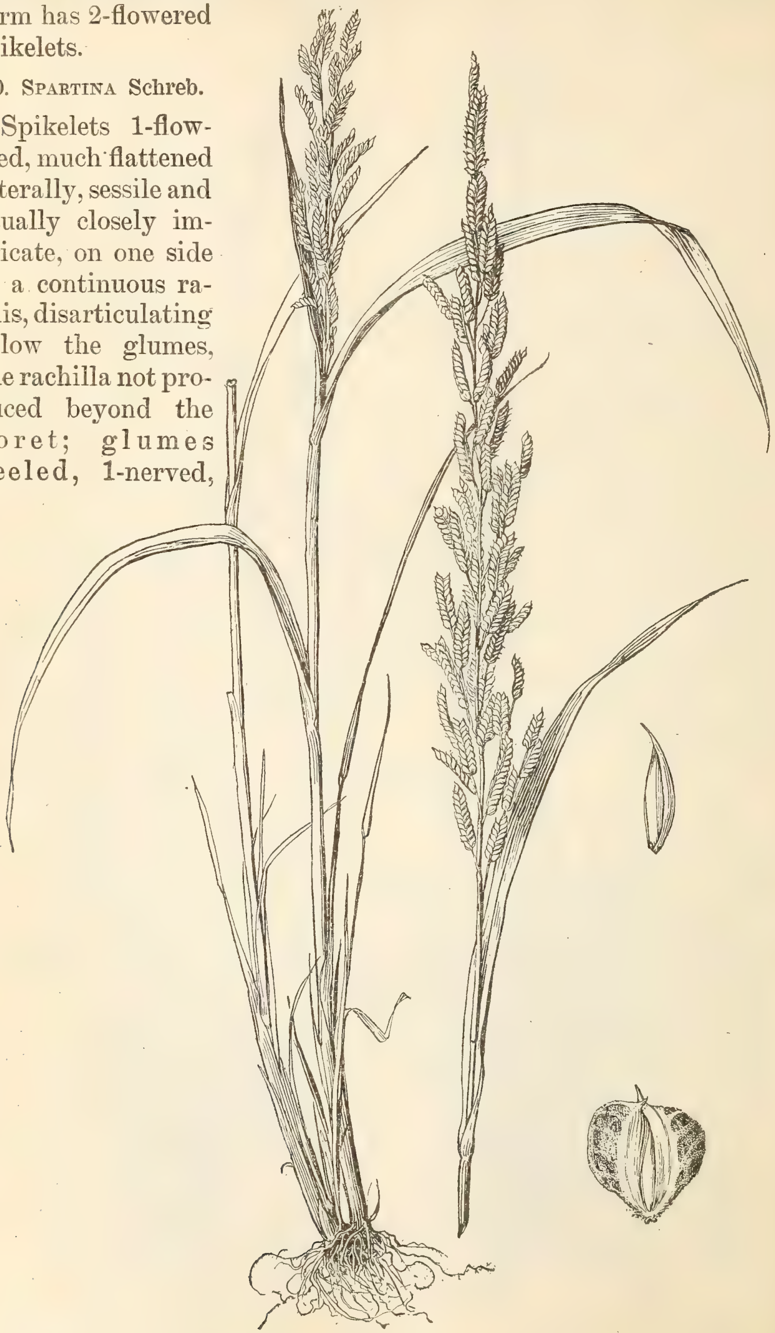

Fig. 108.—Slough-grass, *Beckmannia erucaeformis*. Plant, × ½; spikelet and floret, × 5.

acute or short-awned, the first shorter, the second often exceeding the lemma; lemma firm, keeled, the lateral nerves obscure, narrowed to a rather obtuse point; palea 2-nerved, keeled and flattened, the keel between or at one side of the nerves.

Stout, erect, often tall perennials, with usually extensively creeping, firm, scaly rhizomes, long tough blades, and two to many appressed or sometimes spreading spikes racemose on the main axis. Species about 14, all North American except two or three along the coast of Europe, Africa, and South America.

Type species: *Spartina schreberi* Gmel.

Spartina Schreb.; Gmel., Syst. Nat. ed. 13. **2**: 123. 1791. The genus was first described by Schreber in his Genera Plantarum,[1] but no species was mentioned. Gmelin merely assigns a specific name to the description given by Schreber. *Spartina schreberi* is not recognized by European botanists, but it doubtless is the common European species, *S. maritima* (Curt.) Fernald (*S. stricta* Roth).

Trachynotia Michx., Fl. Bor. Amer. **1**: 63. 1803. Type species *T. cynosuroides.* Michaux describes three species, *T. cynosuroides*, *T. polystachya*, and *T. juncea.* The first species described is what is now called *Spartina michauxiana* Hitchc., but the synonym, *Dactylis cynosuroides* L., from which the specific name is taken, shows that Michaux had misapplied the name. The second species, *T. polystachya*, is *Dactylis cynosuroides* L., now called *Spartina cynosuroides* (L.) Roth. Michaux remarks that this may be only a variety of the first species. It appears then that to Michaux the first species typifies the genus, and hence is selected here as the type species.

Limnetis Pers., Syn. Pl. **1**: 72. 1805. Four species are described, *L. pungens*, *L. juncea*, *L. cynosuroides*, and *L. polystachya.* The first species, which is the same as *Spartina maritima*, is selected as the type, as that is a native of Europe and is indigenous from the standpoint of the author. The other three species are American.

There are eight species in the United States. All but two are found on or near the coast. *Spartina cynosuroides* (L.) Roth, a stout grass as much as 9 feet tall, is found along the Atlantic coast. The commonest coastal species is *S. patens* (Ait.) Muhl. (including *S. juncea* Michx.), which covers vast areas of salt marsh from Newfoundland to Texas. This is a slender wiry species usually less than 3 feet tall, with only a few somewhat spreading spikes. *Spartina alterniflora* Loisel. and its two varieties, *glabra* (Muhl.) Fern. and *pilosa* (Merr.) Fern., also of the Atlantic coast, have stout stems and closely appressed spikes, forming a cylindric inflorescence. A somewhat local species, *S. spartinae* (Trin.) Merr., is found on the Texas coast. Another local species, *S. foliosa* Trin., is found on the coast of California. The only species without well-marked rhizomes is *S. bakeri* Merr., of the fresh-water marshes and low savannas of Florida and coastal Georgia. Two species are found in the interior of the United States. One, *S. michauxiana* Hitchc. (fig. 109), is common in marshes and sloughs from New England to the Great Plains. A second, *S. gracilis* Trin., is found in alkaline grassland in the Western States. The first of these is used for thatching sheds and covering hay stacks. The leaves of

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[1] Schreb. Gen. Pl. **1**: 43. 1789.

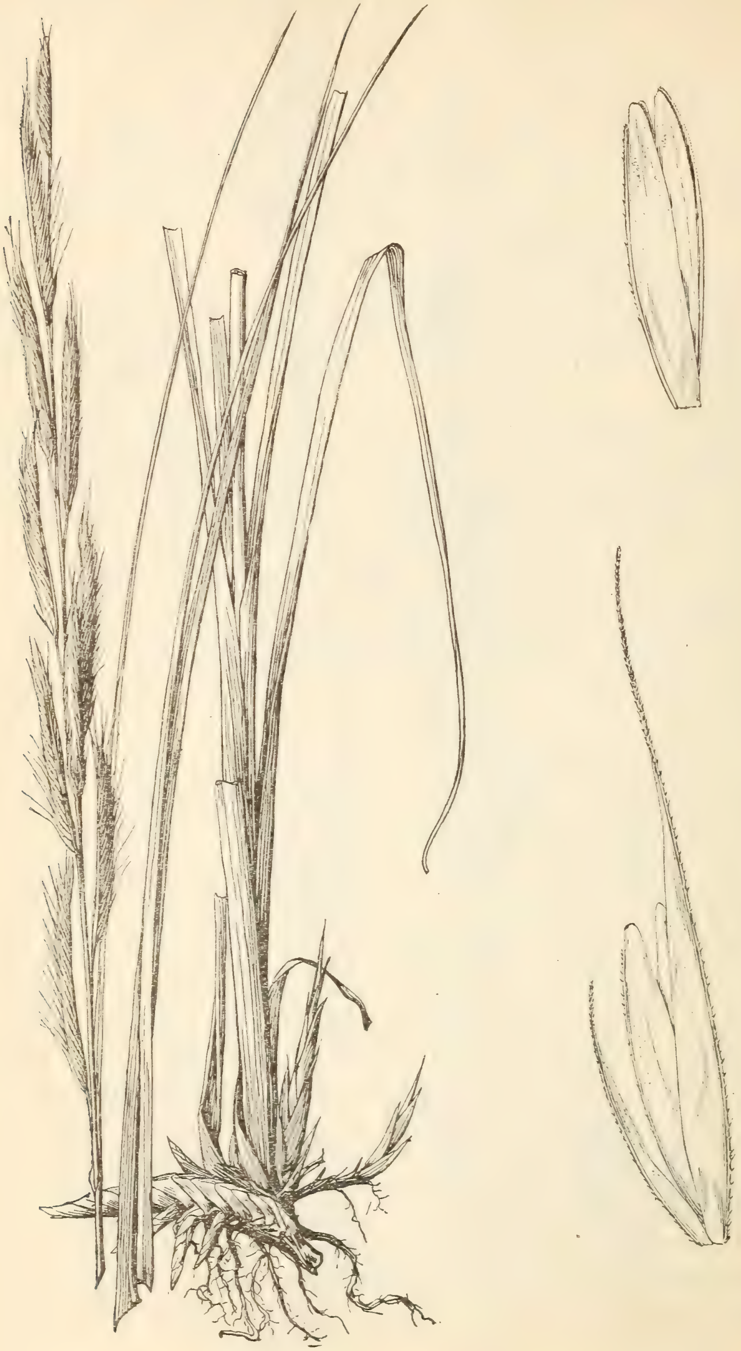

FIG. 109.—Marsh-grass, *Spartina michauxiana*. Plant, × ½; spikelet and floret, × 5.

S. bakeri and *S. patens juncea* (Michx.) Hitchc. are used for making brooms. The marsh hay of the Atlantic coast, much used for bedding and packing, often consists largely of *S. patens*. The species of Spartina are too coarse for forage.

For a revision of the species found in the United States, see Merrill, U. S. Dept. Agr., Bur. Pl. Ind. Bull. 9. 1912.

91. CAMPULOSUS Desv.

(*Ctenium* Panzer.)

Spikelets several-flowered but with only one perfect floret, sessile and closely imbricate, on one side of a continuous rachis, the rachilla disarticulating above the glumes; glumes unequal, the first small, hyaline, 1-nerved, the second as long as the lemmas, firm, 3 to 4 nerved, bearing on the back a strong divergent awn; lemmas rather papery, 3-nerved, villous on the lateral nerves and on the callus, bearing a short straight awn on the back just below the apex, the first and second lemmas empty, the third inclosing a perfect flower, the upper 1 to 3 empty and successively smaller.

Erect, slender, rather tall perennials, with usually solitary, often curved spikes. Species about 12, in the warm regions, three being in the Eastern Hemisphere and the rest in America; two species are found in the southeastern United States.

Type species: *Chloris monostachya* Michx.

Campulosus Desv., Nouv. Bull. Soc. Philom. Paris **2**: 189. 1810. Two species are mentioned, *C. gracilior* Desv. (based on *Chloris monostachya* Michx., which is *Campulosus aromaticus*), and *C. hirsutus* Desv. (based on *Chloris falcata* Swartz). The first is selected as the type. The second is now referred to Harpechloa.

Ctenium Panzer, Denkschr. Baier. Akad. Wiss. München **4**: 288, pl. 13. 1813. (Ideen Gatt. Gräser, 38.) Only one species is described, *Chloris monostachya* Michx., to which Panzer gives the name *Ctenium carolinianum*.

Monocera Ell., Bot. S. C. and Ga. **1**: 176. 1816. A single species, based on *Aegilops aromaticum* Walt., is included.

Monathera Raf., Amer. Month. Mag. **4**: 190. 1819. "Monocera Elliott . . . must be changed, because there is already a genus of shell of the same name."

Our two species are confined to the Southeastern States, one of them, *Campulosus floridanus* Hitchc., to Florida, the other, *C. aromaticus* (Walt.) Trin. (fig. 110), called toothache grass, extending from North Carolina along the Coastal Plain to Louisiana. Both species are rather infrequent and neither is of importance agriculturally.

92. GYMNOPOGON Beauv.

Spikelets 1 or rarely 2 or 3 flowered, nearly sessile, appressed and usually remote in two rows along one side of a slender continuous rachis, the rachilla disarticulating above the glumes and prolonged behind the one or more fertile florets as a slender stipe, bearing a rudiment of a floret, this sometimes with one or two slender awns;

glumes narrow, acuminate, 1-nerved, usually longer than the floret; lemmas narrow, 3-nerved, the lateral nerves near the margin, the apex minutely bifid, bearing between the teeth a slender awn, or rarely awnless.

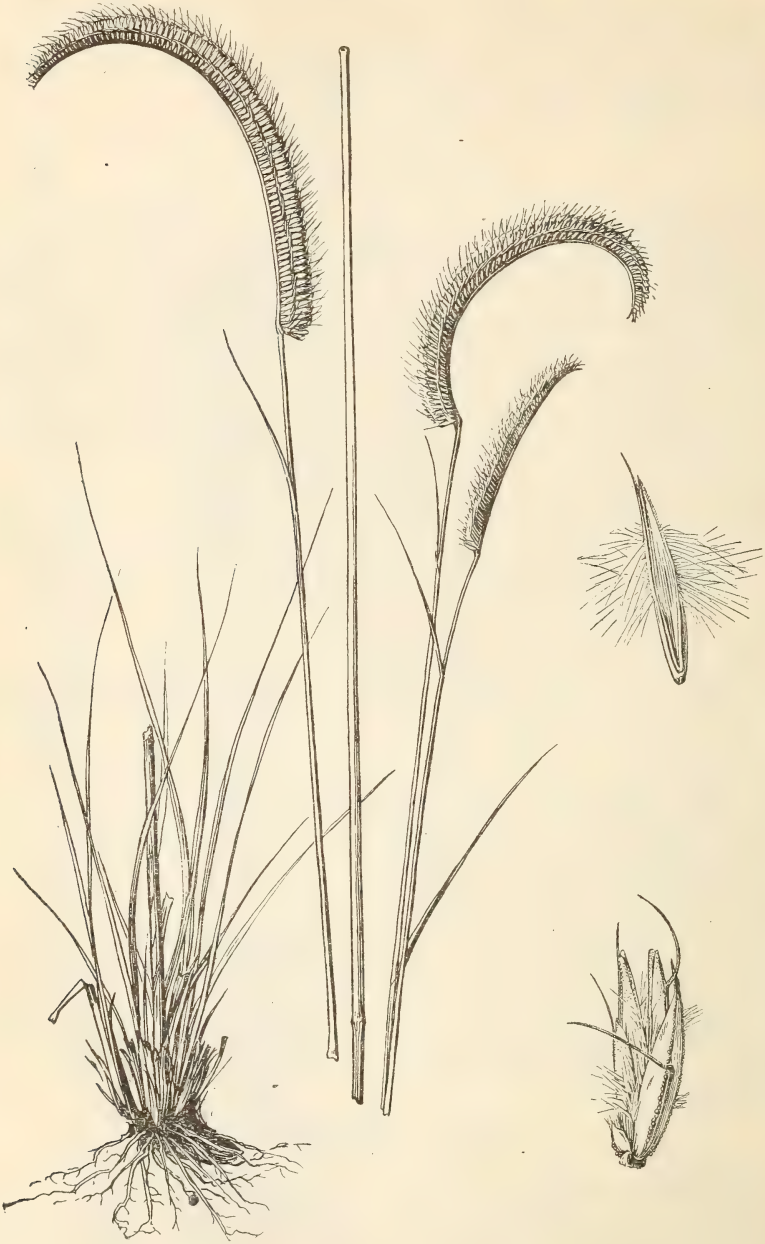

FIG. 110.—Toothache grass, *Campulosus aromaticus*. Plant, × ½; spikelet and fertile floret (palea side up), × 5.

Perennial or rarely annual grasses, with short, flat, stiff blades, numerous stiff, slender, divergent spikes loosely scattered along the upper part of the culm, or sometimes aggregate toward the summit, the spikes often deflexed at maturity. Species 10, nearly all American; 3 species in the southeastern United States.

Type species: *Andropogon ambiguus* Michx.

Gymnopogon Beauv., Ess. Agrost. 41, pl. 9, f. 3. 1812. Beauvois mentions one species, *Andropogon ambiguus* Michx., which is figured. In the description of the plate the name given is *Gymnopogon racemosus.*

Alloiatheros Ell., Bot. S. C. and Ga. 1: 146. 1816. This name is casually mentioned by Elliott in the description of *Andropogon ambiguus:* "I once intended to insert it as a distinct genus under the name of Alloiatheros, from the dissimilarity of its awns, not only in position but in figure."

Anthopogon Nutt., Gen. Pl. 1: 81. 1818. Based on *Andropogon ambiguus* Michx., which name Nuttall changes to *Anthopogon lepturoides.*

The spikelets are usually 1-flowered and awned, but in *Gymnopogon chapmanianus* Hitchc., of Florida, they are 2 to 4 flowered and awnless. This species shows in its spikelet characters a transition to Leptochloa, but in habit it closely resembles the other two species of the United States. In *G. foliosus* (Willd.) Nees, of Porto Rico and South America, the rudiment bears two long awns. Our species are perennials, with an inflorescence of scattered spikes.

Our commonest species is *Gymnopogon ambiguus* (Michx.) B. S. P. (fig. 111), found in sandy soil from New Jersey to Missouri and south to Florida and Texas. Another species, *G. brevifolius* Trin., grows from New Jersey to Florida. This species differs from the preceding in having the rachis spikelet bearing only along the upper half. The species have no agricultural importance.

93. Chloris Swartz.

Spikelets with 1 perfect floret, sessile, in two rows along one side of a continuous rachis, the rachilla disarticulating above the glumes, produced beyond the perfect floret and bearing 1 to several reduced florets consisting of empty lemmas, these often truncate, and, if more than one, the smaller ones inclosed in the lower, forming a usually club-shaped rudiment; glumes somewhat unequal, the first shorter, narrow, acute; lemma keeled, usually broad, 1 to 5 nerved, often villous on the callus and villous or long-ciliate on the keel or marginal nerves, awned from between the short teeth of a bifid apex, the awn slender or sometimes reduced to a mucro, the sterile lemmas awned or awnless.

Perennial or sometimes annual, tufted grasses, with flat blades and two to several often showy and feathery spikes aggregate at the summit of the culms. Species about 60, in the warmer regions; 15 in the southern United States.

Type species: *Agrostis cruciata* L.

Chloris Swartz, Prod. Veg. Ind. Occ. 25. 1788. Swartz describes five species, *C. cruciata, C. ciliata, C. petraea, C. polydactyla,* and *C. radiata,* all from the

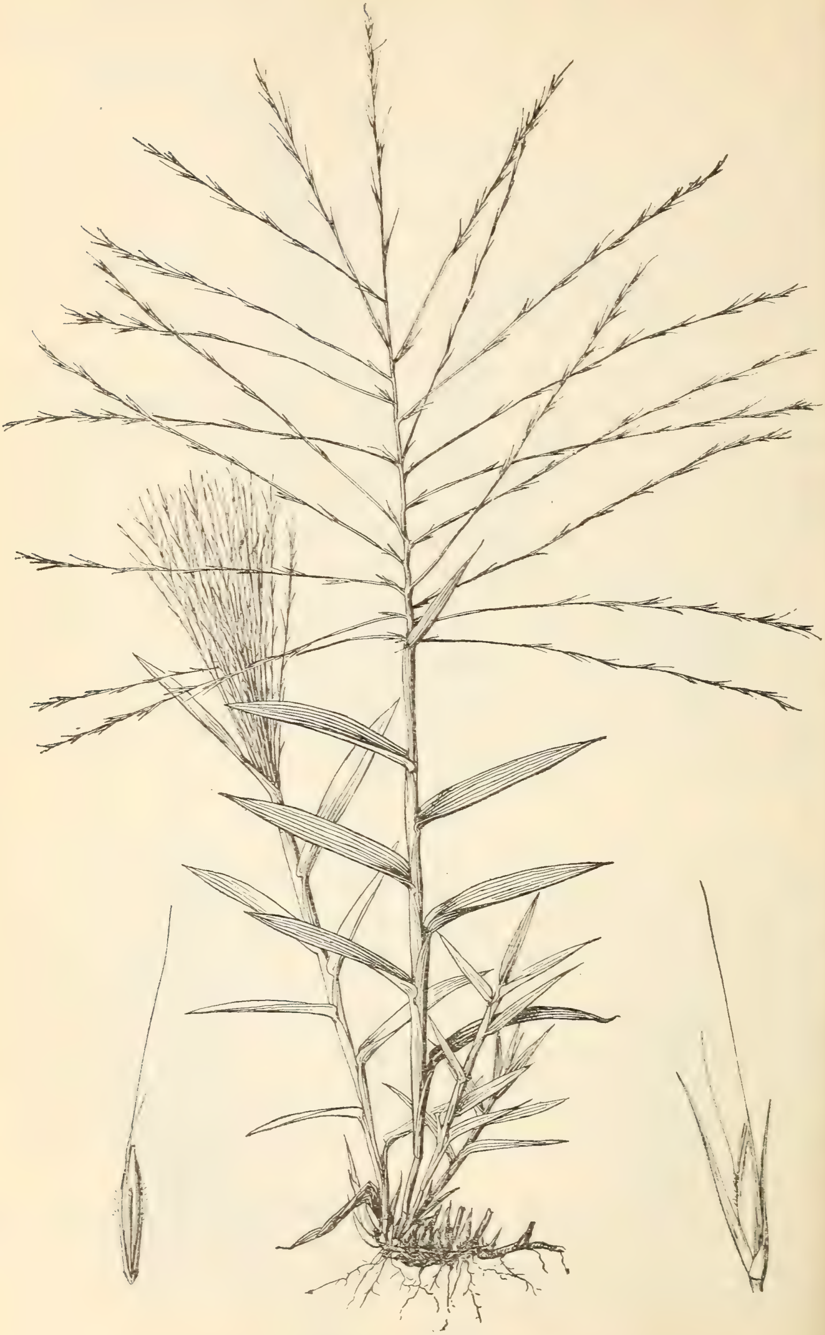

FIG. 111.—*Gymnopogon ambiguus.* Plant, × ½; spikelet and floret, × 5.

West Indies. The second and third are described as new; the others are based on Linnæan species, the first on *Agrostis cruciata*, the fourth on *Andropogon polydactylon*, and the fifth on *Agrostis radiata*. The first species is selected as the type.

Eustachys Desv., Nouv. Bull. Soc. Philom. Paris **2**: 188. 1810. One species is described, *E. petraeus*, based on *Chloris petraea* Swartz. Eustachys, recognized by some American botanists as distinct, forms a section of the genus Chloris and includes four species, *C. petraea*, *C. glauca* (Chapm.) Vasey, *C. floridana* (Chapm.) Vasey, and *C. neglecta* Nash. The group differs from Euchloris in having the lemmas short-awned or mucronate, brown, and rather firm in texture.

Chlorostis Raf., Princip. Fondament. Somiologie 26, 29. 1814. Proposed change of name for Chloris Swartz, because of Chlora L. (an animal).

Several species are found on the plains of Texas, where they form an unimportant part of the forage for grazing animals. *Chloris verticillata* Nutt. and its allies are known as windmill grasses. The mature inflorescence, consisting of several slender, divergent spikes, breaks away from the plant and rolls before the wind as a tumbleweed. In the Southwestern States is found *C. virgata* Swartz (*C. elegans* H. B. K.) (fig. 112), a tufted annual, 1 to 2 feet high, with several pale or purplish, erect, feathery spikes 1 to 2 inches long. This species invades cultivated fields and sometimes becomes a rather common weed, especially in alfalfa fields.

One species, *C. gayana* Kunth, a native of South Africa, is cultivated to a limited extent as a forage grass. This species, called Rhodes grass, has been shown to have value as a meadow grass in the Southwestern States. In the Hawaiian Islands it is used on some of the ranches in the drier regions. Rhodes grass is a perennial, 2 to 3 feet high, producing long, stout, creeping, propagating stems or stolons and bearing at the summit of the flowering stems a close fan-shaped cluster of numerous spikes 2 to 4 inches long.

For a revision of the species of Eustachys and Chloris found in the United States, see Nash, Bull. Torrey Club **25**: 432–450. 1898.

94. TRICHLORIS Fourn.

Spikelets 1 to few flowered, nearly sessile, in two rows along one side of a continuous slender rachis, the rachilla disarticulating above the glumes and prolonged behind the uppermost perfect floret, bearing a reduced, usually awned floret; glumes unequal, acuminate, or short-awned, the body shorter than the lower lemma; lemmas narrow, 3-nerved, the marginal nerves sometimes pubescent, these and the midnerve extending into awns, the central long and slender, the lateral often much shorter.

Erect, slender, tufted perennials, with flat blades and numerous erect or ascending spikes, aggregate but scarcely digitate at the summit of the culms. Species two or three, in the dry regions of Texas and Mexico and also in Argentina.

Type species: *Trichloris pluriflora* Fourn.

Trichloris Fourn., Mex. Pl. 2: 142. 1886. Fournier includes two species, *T. fasciculata* and *T. pluriflora*, both described as new. In the generic description occurs the statement "flore summo tabescente mutico." Under the second species one finds "flore summo mutico." From this it would appear that *T. pluriflora* represented Fournier's idea of the genus; hence this species is selected as the type.

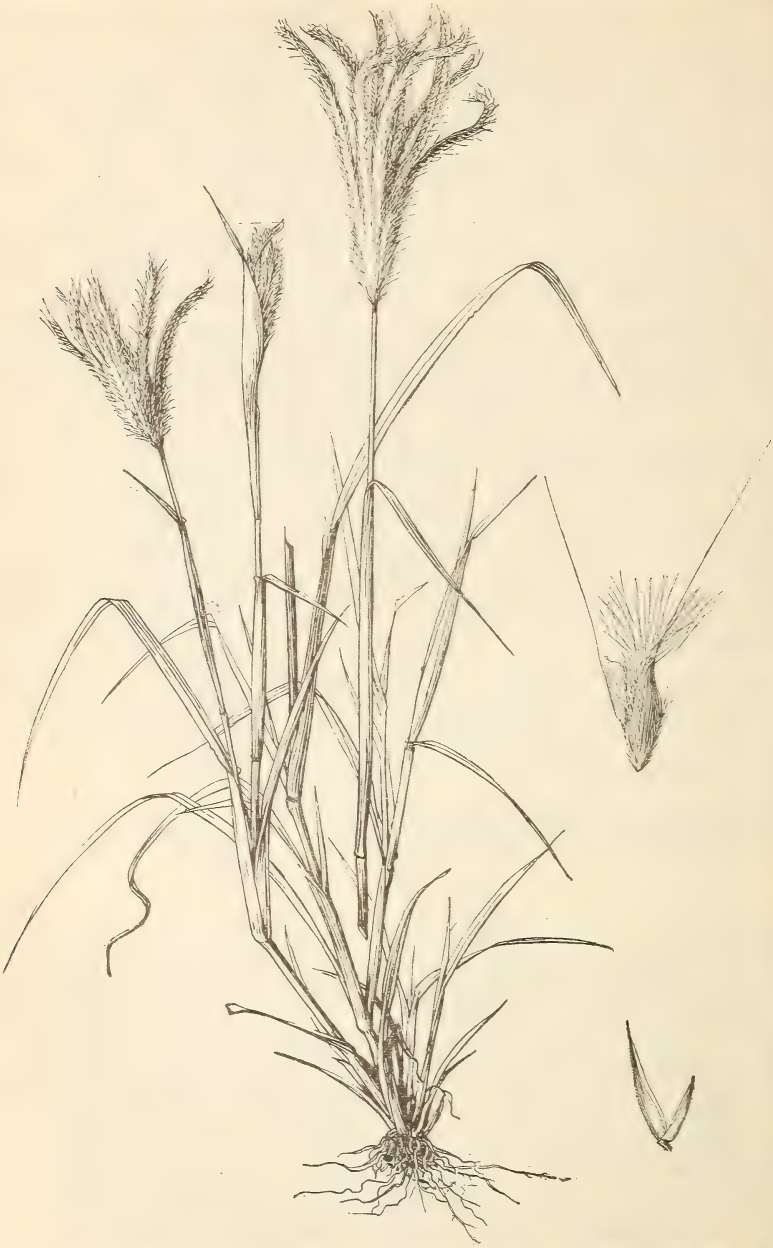

FIG. 112.—*Chloris virgata*. Plant × ½; glumes and floret with rudiment, × 5.

Chloropsis Hack.; Kuntze, Rev. Gen. Pl. 2: 771. 1891. The name was mentioned by Hackel[1] as a synonym under Trichloris. Hackel also mentions Chloridopsis, both names having been used by gardeners for *Trichloris blanchardiana* Hack. of Argentina. Kuntze changes the name Trichloris to Chloropsis, because of the earlier Trichlora Baker. Both Trichlora and Trichloris may be considered valid, since they have different derivations and slightly different spellings. Since Kuntze adopts Hackel's name and since Hackel mentions *Chloropsis blanchardiana*, this species is selected as the type of Chloropsis.

The two species of the United States, *Trichloris mendocina* (Phil.) Kurtz (*T. fasciculata* Fourn.) (fig. 113) and *T. pluriflora* Fourn., are found in the arid regions of northern Mexico and extend into western Texas, southern New Mexico, and southern Arizona. The first has spikelets with one perfect floret and a rudiment, each with three long awns; the second has spikelets with 3 to 5 florets, the upper one or two reduced, the lateral awns reduced or sometimes wanting. Neither is of importance agriculturally.

95. BOUTELOUA Lag., the grama grasses.

Spikelets 1-flowered, with the rudiments of one or more florets above, sessile, in two rows along one side of the rachis; glumes unequal, 1-nerved, acuminate or awn-tipped, the first shorter and narrower; lemma as long as the second glume or a little longer, 3-nerved, the nerves extending into short or often rather long awns, the internerves usually extending into teeth; palea 2-nerved, sometimes 2-awned; rudiment various, usually 3-awned, a second rudimentary floret sometimes present.

Perennial or sometimes annual, low or rather tall grasses, with two to several or many spikes racemose on a common axis, or sometimes solitary, the spikelets few to many in each spike, rarely solitary, pectinate or more loosely arranged and appressed, the rachis of the spike usually produced beyond the insertion of the spikelets. Species 38, all American and chiefly North American; 18 species found in the United States, mostly in open grassland of the southwestern States.

Type species: *Bouteloua racemosa* Lag.

Bouteloua Lag., Varied. Cienc. Lit. and Art. 2^4: 134. 1805. Lagasca gives five species, *B. racemosa*, *B. hirsuta*, *B. barbata*, *B. simplex*, and *B. prostrata*. All are briefly described, except the last, which is mentioned by name only. The first species (which is the same as *B. curtipendula*) is selected as the type. In this work Lagasca spells the name of the genus "Botelua" and states that he names the genus in honor of the two brothers Boutelou. In a later work[2] Lagasca describes the genus under the name Bouteloua, and includes 10 species, the first of which is *B. hirsuta*. The spelling Bouteloua is retained because it was corrected to this form by the author to correspond to the spelling of the personal name of the brothers Boutelou, and because this second spelling has been universally accepted by botanists.

Atheropogon Muhl.; Willd., Sp. Pl. 4: 937. 1806. A single species is described, *A. apludioides Muhl.*, which is *Bouteloua curtipendula*.

Triathera Desv., Nouv. Bull. Soc. Philom. Paris 2: 188. 1810. Based on *Aristida americana* L., which is *Bouteloua americana* (L.) Scribn., a West Indian species.

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[1] In Engl. and Prantl, Pflanzenfam. 2^2: 59. 1887.

[2] Gen. and Sp. Nov. 5. 1816.

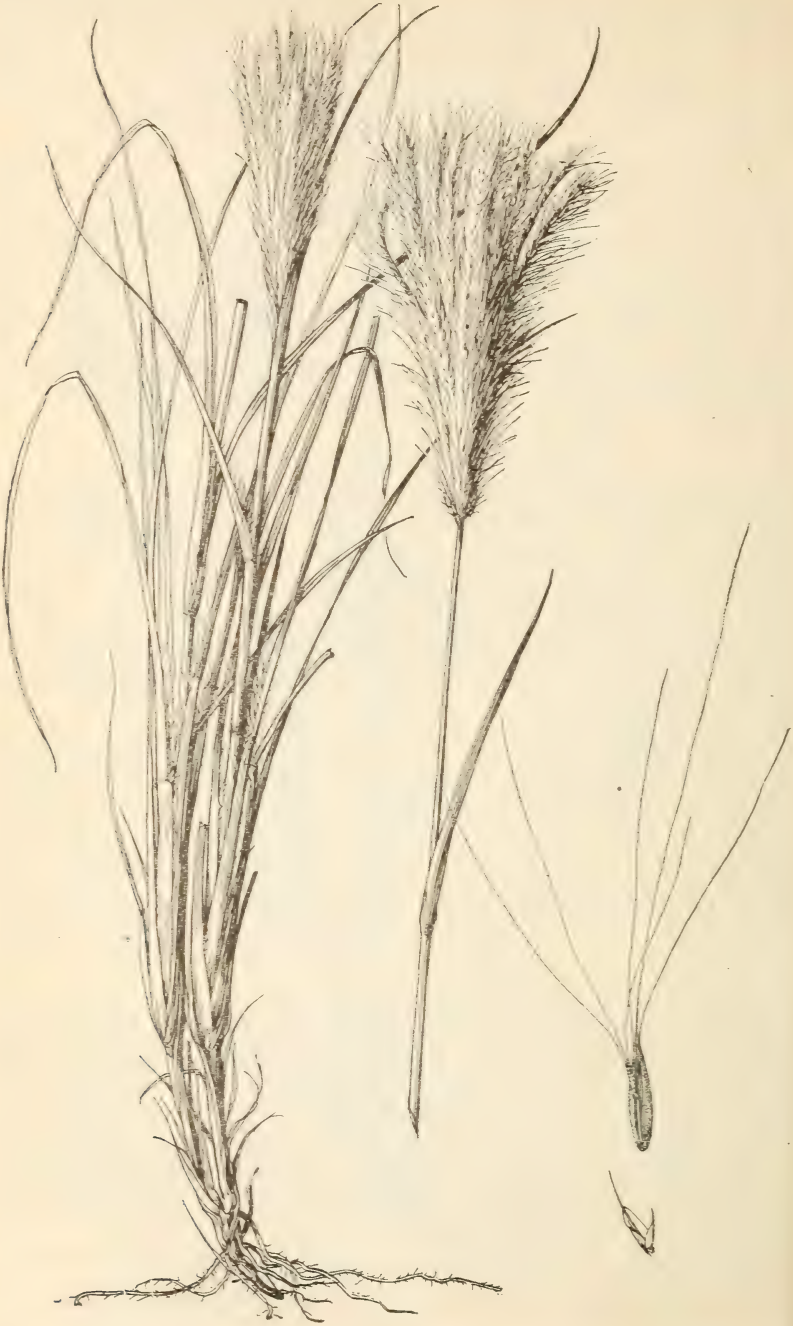

FIG. 113.—*Trichloris mendocina.* Plant, × ½; glumes and floret with rudiment, × 5.

Heterosteca Desv., Nouv. Bull. Soc. Philom. Paris 2: 188. 1810. Based on *H. juncifolia*, which is *Bouteloua heterostega* (Trin.) Griffiths, of the West Indies.

Chondrosium Desv., Nouv. Bull. Soc. Philom. Paris 2: 188. 1810. Based on *Chloris procumbens* Durand (*Bouteloua procumbens*).

Polyodon H. B. K., Nov. Gen. and Sp. 1: 174, pl. 55. 1816. Based on a single species, *P. distichum* H. B. K.

Triaena H. B. K., Nov. Gen. and Sp. 1: 178. 1816. A single species described, *T. racemosa*, which is *Bouteloua triaena* (Trin.) Scribn.

Eutriana Trin., Fund. Agrost. 161. 1820. Trinius includes two species, *E. curtipendula* and *E. bromoides*. The first is selected as the type.

The species fall into two rather well marked divisions, those in which the spikelets are crowded and pectinate and the spikes persistent on the main axis, the florets falling, and those in which the spikelets are less crowded, ascending rather than pectinate on the rachis, and the spikes falling entire. *Bouteloua gracilis* and its allies are examples of the first group and *B. filiformis* (Fourn.) Griffiths and its allies, *B. curtipendula* and *B. aristidoides* of the second. The genus is important, since many of the species are the chief ingredient of the grazing lands of the Southwestern States.

Bouteloua gracilis Lag. (*B. oligostachya* Torr.) (fig. 114) is found on the Great Plains from Manitoba to Mexico and even southward to South America. It is the blue grama of the ranchmen and, along with buffalo grass (*Bulbilis dactyloides*) and curly mesquite (*Hilaria belangeri*), constitutes most of what is known in the Middle West as "short-grass." Blue grama is a tufted perennial, with numerous short leaves and a flower stalk about a foot high with 2 or 3 spikes about an inch long. These spikes, one at the end of the stem and the other one or two a short distance below, turn with the wind like weather vanes. An allied species, *B. hirsuta* Lag., called black grama, is found over about the same region, but is confined chiefly to rocky hills. This species differs in having shorter, more fuzzy spikes and in the prolonged end of the rachis, which forms a distinct point beyond the spikelets.

Another widely distributed species is *Bouteloua curtipendula* (Michx.) Torr. (*B. racemosa* Lag.) (fig. 115), called side-oats grama. It extends farther east than the other species, being found even as far as Connecticut. Side-oats grama is the tallest of the species, sometimes as much as 3 feet, and is further distinguished by the numerous (35 to 50) short, reflexed spikes.

In Arizona and New Mexico other species become prominent. *Bouteloua eriopoda* Torr., called here black grama and woolly-foot, is a low creeping species with woolly stem. *Bouteloua rothrockii* Vasey is the most important range grass in many parts of Arizona. It grows about a foot high and has five or six spikes to each culm. In *B. texana* S. Wats., of the Texas plains, the short triangular spikes fall from the axis entire.

Three species are annuals, *B. aristidoides* Thurb., *B. procumbens* (Durand) Griffiths (*B. prostrata* Lag.), and *B. barbata* Lag. (*B. polystachya* Torr.). These are found from Texas to Arizona, where they are called six-weeks grama. They furnish forage when young, but are of secondary importance.

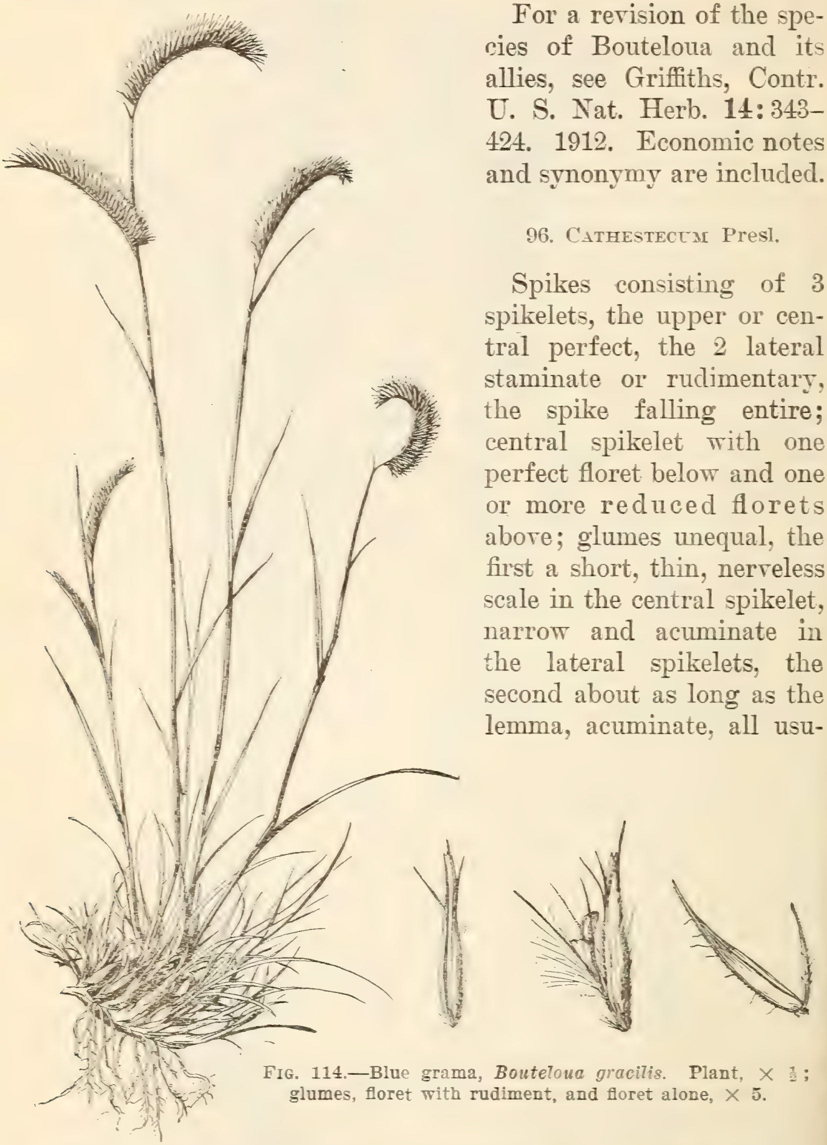

FIG. 114.—Blue grama, *Bouteloua gracilis*. Plant, × ½; glumes, floret with rudiment, and floret alone, × 5.

For a revision of the species of Bouteloua and its allies, see Griffiths, Contr. U. S. Nat. Herb. **14:** 343–424. 1912. Economic notes and synonymy are included.

96. CATHESTECUM Presl.

Spikes consisting of 3 spikelets, the upper or central perfect, the 2 lateral staminate or rudimentary, the spike falling entire; central spikelet with one perfect floret below and one or more reduced florets above; glumes unequal, the first a short, thin, nerveless scale in the central spikelet, narrow and acuminate in the lateral spikelets, the second about as long as the lemma, acuminate, all usually villous; lemma 3-nerved, or rarely 5 to 7 nerved, the nerves extending into awns, and the internerves into teeth; palea 2-nerved, the nerves extending into short awns; second and third floret with a fairly well developed lemma and palea, the fourth floret, if present, usually reduced.

Low cespitose or stoloniferous annuals or perennials, with short blades, and several or many short deciduous spikes scattered along the main axis. Species four, on the Mexican Plateau, one extending into western Texas.

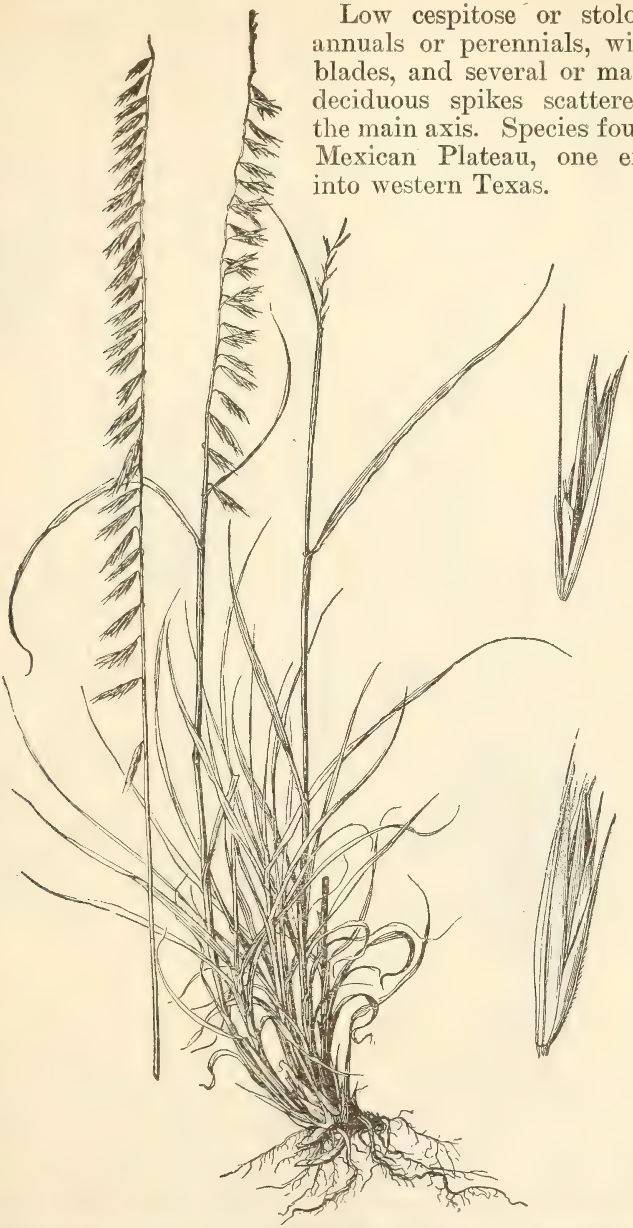

Fig. 115.—Side-oats grama, *Bouteloua curtipendula.* Plant, × ½; spikelet and floret with rudiment, × 5.

Type species: *Cathestecum prostratum* Presl.

Cathestecum Presl, Rel. Haenk. **1**: 294, pl. 42. 1830. Only one species described.

The only species found in the United States is *Cathestecum erectum* Vasey and Hack. (fig. 116), a stoloniferous perennial with the aspect of *Bouteloua texana* but more delicate. This species is known in western Texas from a very few collections, but is more common in northern Mexico. Cathestecum is placed by Bentham[1] doubtfully in the tribe Zoysieae, and by Hackel[2] in the tribe Festuceae. Griffiths[3] shows its affinity to Bouteloua and places it in the tribe Chlorideae.

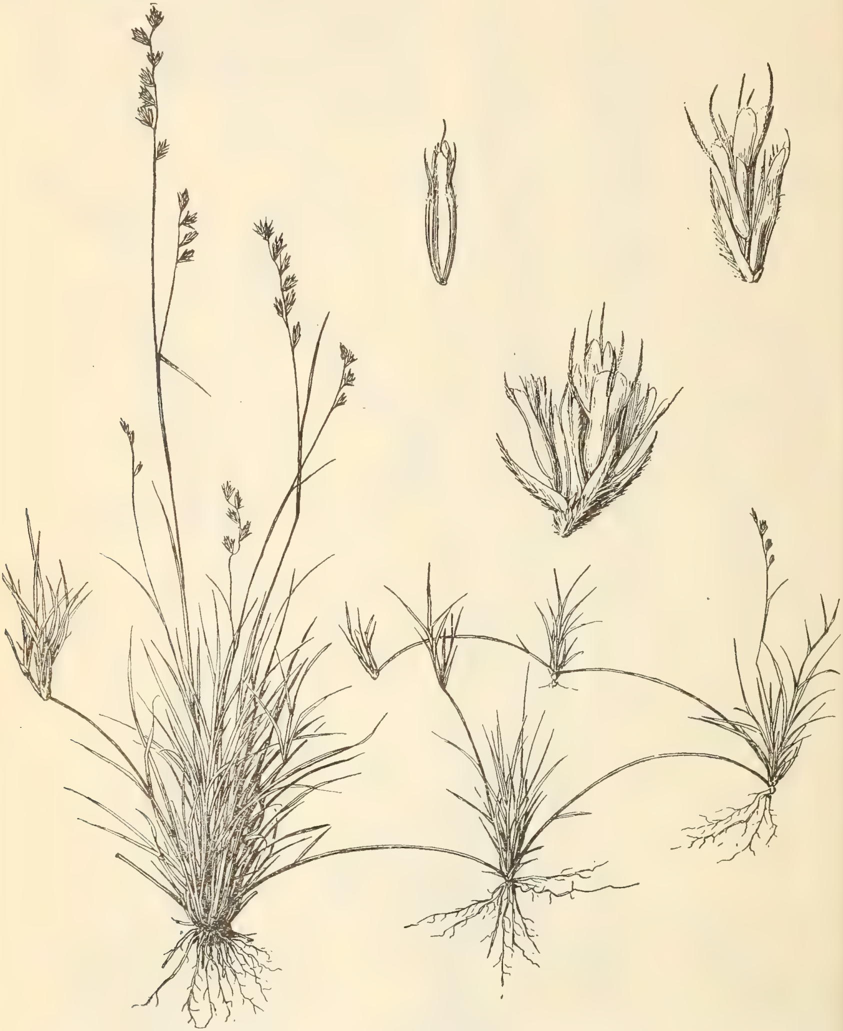

FIG. 116.—*Cathestecum erectum.* Plant, × ½; group of spikelets (reduced spike), central spikelet, and fertile floret, × 5.

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[1] Benth. and Hook. Gen. Pl. 3: 1122. 1883.

[2] Engl. and Prantl, Pflanzenfam. 2^2: 65. 1887.

[3] Contr. U. S. Nat. Herb. 14: 358. 1912.

97. Munroa Torr.

Spikelets in pairs or threes on a short rachis, the lower one or two larger, 3 or 4 flowered, the upper 2 or 3 flowered, the group (reduced spikes) inclosed in the broad sheaths of short leaves, usually about 3 in a fascicle, forming a cluster or head at the ends of the branches; rachilla disarticulating above the glumes and between the florets; glumes of the lower 1 or 2 spikelets equal, 1-nerved, narrow, acute, a little shorter than the lemmas, those of the upper spikelet unequal, the first much shorter or obsolete; lemmas 3-nerved, those of the lower spikelet coriaceous, acuminate, the points spreading, the midnerve extended into a mucro, those of the upper spikelet membranaceous; palea narrow, 2-nerved, inclosing the oval, dorsally compressed caryopsis.

Low spreading, much-branched annuals, the short, flat, pungent leaves in fascicles. Species three, plains of America; two in Argentina, one in the western United States.

Type species: *Crypsis squarrosa* Nutt.

Munroa Torr., U. S. Rep. Expl. Miss. Pac. 4: 158. 1856. One species described, *M. squarrosa* (Nutt.) Torr. Torrey spells the genus Monroa, naming it in honor of Munro, whom he refers to erroneously as Major "Monro."

The prophylla are prominent in the fascicles of leaves, the two nerves extending into long, green tips. The lower spikelet is bulged out on the lower side, throwing the glumes forward; thus they appear somewhat asymmetric. This genus has hitherto been placed in Festuceae, but the structure of the spikelet and spike show closer affinity to genera of Chlorideae.

Munroa squarrosa (fig. 117) is common on the Great Plains from Montana to northern Mexico, usually in new soil and open ground. It has little or no importance as a forage grass. It is sometimes abundant on recently broken sod. *Munroa mendocina* Phil., of Argentina, has been referred to *M. squarrosa*, but it is a distinct species.

98. Bulbilis Raf.
(*Buchloë* Engelm.)

Plants unisexual. Staminate spikelets 2-flowered, sessile and closely imbricate, in two rows on one side of a slender rachis forming a short spike; glumes somewhat unequal, rather broad, 1-nerved, acutish; lemmas longer than the glumes, 3-nerved, rather obtuse, whitish; palea as long as its lemma, 2-nerved. Pistillate spikelets mostly 3 to 5 in a short spike or head, this falling entire, usually 2 heads to the inflorescence, the common peduncle short and included in the somewhat inflated sheaths of the upper leaves, the thickened somewhat woody rachis and the 2 or 3 outer (second) glumes appearing like an involucre; glumes very unequal, the first inside relative to the cluster, thin, 1-nerved, keeled, the nerve extending into a point or awn, as long as the lemma or reduced in some of the spikelets or wanting, the second glume firm, thick and woody, almost surrounding the remainder of the spikelet, rounded on the back, white or yellowish, obscurely nerved, the margins inflexed, thin, ciliate, the upper part greenish, acuminate, spreading, with one or two teeth at the sides; lemma firm-membranaceous, 3-nerved, dorsally compressed, broad below, narrowed into a 3-lobed green summit, the middle lobe much the larger; palea 2-nerved, broad, obtuse, about as long as the body of the lemma, enveloping the caryopsis.

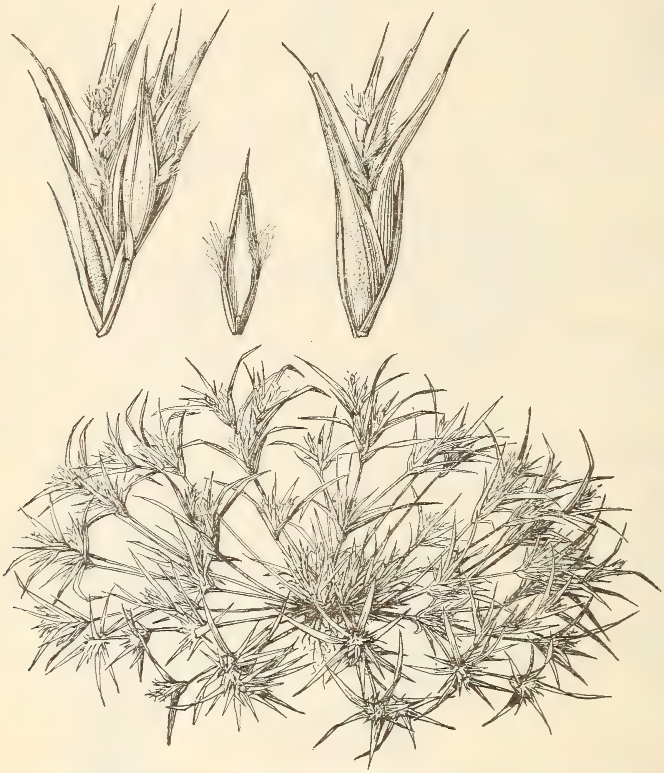

Fig. 117.—*Munroa squarrosa.* Plant, × ½; group of spikelets (reduced spike), spikelet, and floret, × 5.

A low stoloniferous perennial, with short curly blades, the staminate flowers in two or three short spikes on slender, erect culms, the pistillate in sessile clusters partly hidden among the leaves. Species one, on the Great Plains from Montana to Mexico.

Type species: *Sesleria dactyloides* Nutt.

Bulbilis Raf., Amer. Month. Mag. **4**: 190. 1819. Rafinesque gives a review of Nuttall's Genera of North American Plants. The part relating to Bulbilis is, "Sesleria dactyloides must form a peculiar genus by Mr. N's own account, it may be called Bulbilis."

Calanthera Kunth, in Hook. Kew Journ. **8**: 18. 1856. A single species included, "C. dactyloides Kth.—Nutt. Sesleria . . . Buffalo grass."

Buchloë Engelm., Trans. Acad. St. Louis 1: 432. 1859. Based on *Sesleria dactyloides*. Engelmann gave the first description of the genus. Nuttall's description of *Sesleria dactyloides* was based on the staminate plant.

The species is usually described as diœcious[1] because the staminate and pistillate flowers are found on different individuals. Experiments in growing the plants from seed show that they are monœcious, the two kinds of flowers arising from distinct branches which propagate vegetatively, each branch producing its own kind.[2] Plank[3] observed that seedlings were monœcious.

Bulbilis dactyloides (Nutt.) Raf. (*Buchloë dactyloides* Engelm.) (fig. 118), commonly known as buffalo grass, is one of the chief constituents of the sod on the Great Plains. It forms, when unmixed with other grasses, a close, soft, grayish green turf. Buffalo grass is dominant over large areas on the uplands, colloquially known as the "short-grass country," and is one of the most important grazing grasses of this region. The sod houses of the early settlers were made mostly from the sod of this grass.

8. PHALARIDEAE, THE CANARY-GRASS TRIBE.

99. Torresia Ruiz and Pav.

(*Hierochloë* R. Br., *Savastana* Schrank.)

Spikelets with one terminal perfect floret and two staminate florets, disarticulating above the glumes, the staminate florets falling attached to the fertile one; glumes equal, broad, thin and papery, smooth, acute; sterile lemmas about as long as the glumes, mostly somewhat appressed-hispid, sometimes awned from between two lobes; fertile lemma somewhat indurate, about as long as the others, smooth or nearly so, awnless; palea 3-nerved, rounded on the back.

Perennial, low, erect, sweet-smelling grasses, with small panicles of bronze-colored spikelets. Species about 17, confined to cool and alpine regions; 3 species in the United States.

Type species: *Torresia utriculata* Ruiz and Pav.

Savastana Schrank, Baier. Fl. 1: 100, 337, 1789, not Savastania Scop., 1777. Type, *S. hirta* Schrank, the only species described.

Torresia Ruiz and Pav., Syst. Veg. Peruv. Chil. 251. 1798. A single species described.

Hierochloë R. Br., Prodr. Fl. Nov. Holl. 208. 1810. Type, *Disarrenum antarcticum* Labill. upon which is based the only species described (*H. antarctica*). Later authors have often spelled this Hierochloa.

Dimesia Raf., Amer. Month. Mag. 2: 175. 1818. Based on "*Holcus fragrans* of Pursh's Flora." This is the same as *Torresia odorata*.

The common species, *Torresia odorata* (L.) Hitchc. (*Hierochloë odorata* Wahl., *H. borealis* Roem. and Schult.) (fig. 119), called holy grass, vanilla grass, or Seneca grass, grows in Canada and the northern part of the United States. Like all the species of the genus and the allied genus Anthoxanthum, it is sweet scented, owing to the

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[1] Pilger discusses this and other species in a paper on monœcious and diœcious grass genera. Bot. Jahrb. Engler 34: 377. 1904.

[2] Hitchcock, Bot. Gaz. 20: 464. 1895.

[3] Bull. Torrey Club 19: 303. 1892.

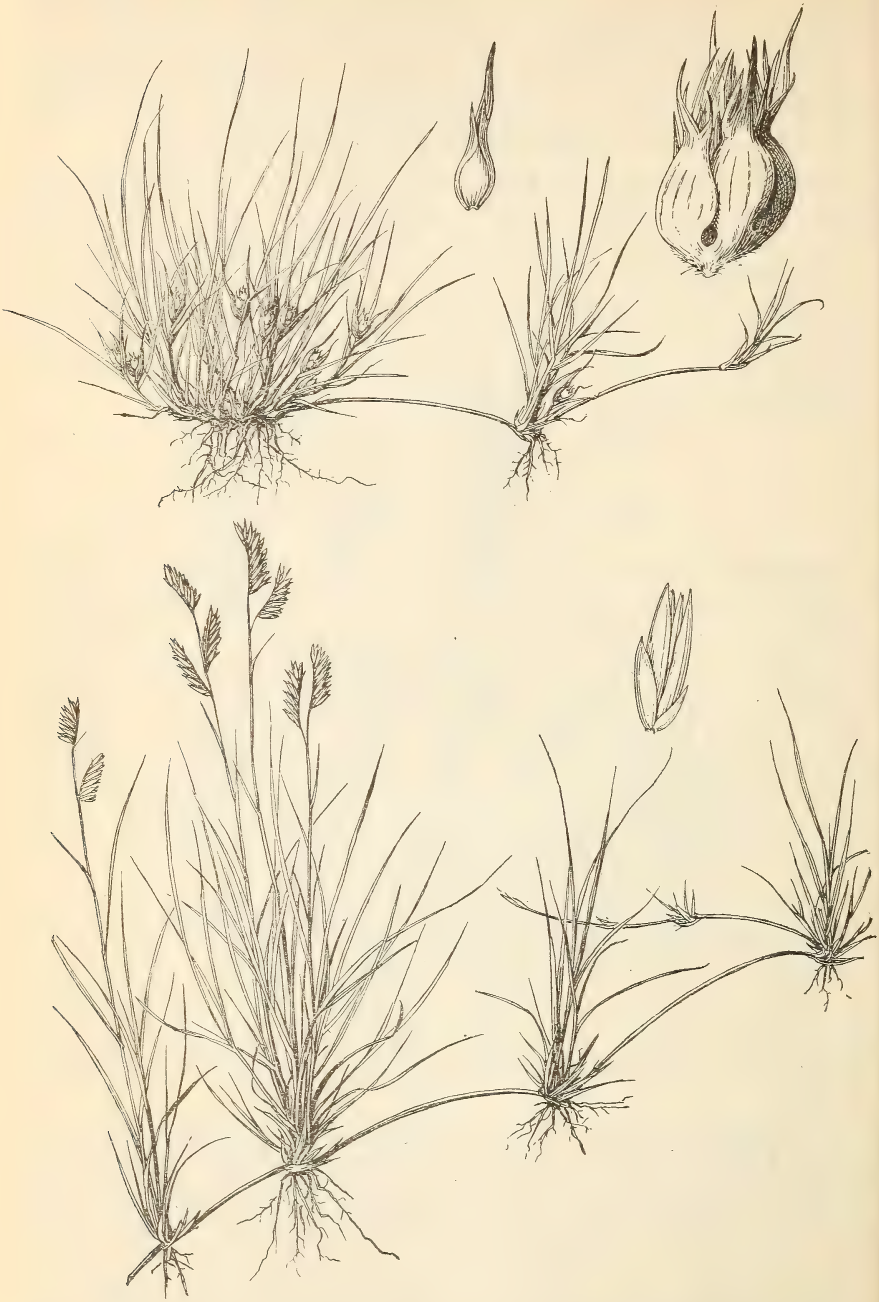


Fig. 118.—Buffalo grass, *Bulbilis dactyloides.* Pistillate plant (above), × ½; group of pistillate spikelets (reduced spike), and floret, × 5; staminate plant (below), × ½; staminate spikelet, × 5.

presence of coumarin. The Indians use the grass to make fragrant baskets.

Torresia alpina (Swartz) Hitchc., with small, condensed panicles and awned staminate florets, is arctic and extends to the alpine peaks of New York and New England; *T. macrophylla* (Thurb.) Hitchc., with broad blades, is Californian.

100. Anthoxanthum L.

Spikelets with 1 terminal perfect floret and 2 sterile lemmas, the rachilla disarticulating above the glumes, the sterile lemmas falling attached to the fertile floret; glumes unequal, acute or mucronate; sterile lemmas shorter than the glumes, empty, awned from the back; fertile lemma shorter than the sterile ones, awnless; palea 1-nerved, rounded on the back, inclosed in the lemma.

Sweet-smelling annual or perennial grasses, with flat blades and spikelike panicles. Species about four, Europe and Asia; two introduced into the United States.

Type species: *Anthoxanthum odoratum* L.

Anthoxanthum L., Sp. Pl. 28, 1753; Gen. Pl., ed. 5, 17. 1754. Linnæus describes three species, *A. odoratum*, *A. indicum*, and *A. paniculatum*. The first is chosen as the type. The second species is now referred to Perotis and the third to Festuca.

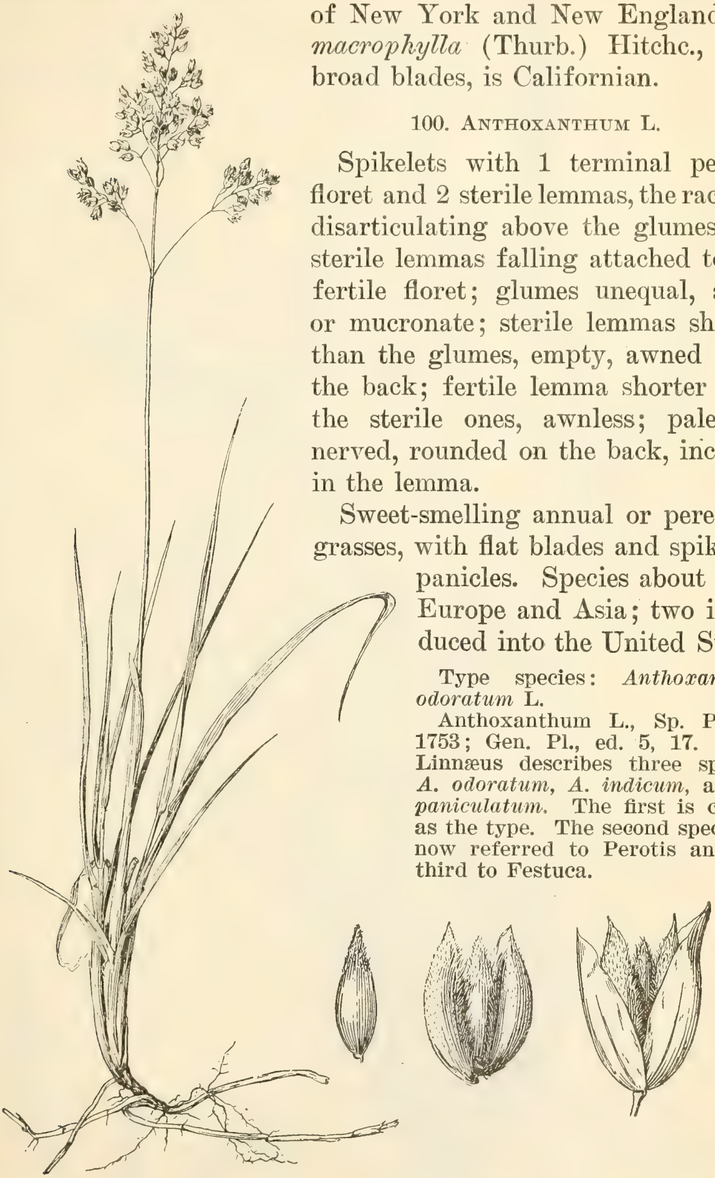


FIG. 119.—Vanilla grass, *Torresia odorata*. Plant, × ½; spikelet, florets with the glumes removed, and fertile floret, × 5.

Anthoxanthum odoratum, sweet vernal grass (Pl. XV; fig. 120), is sometimes included in meadow mixtures to give fragrance to the hay.

The grass has no forage value. It is now common along roadsides and in grassland throughout the Eastern States. Like the species of Torresia it has an aromatic odor due to the presence of coumarin. Sweet vernal grass is an erect perennial, about a foot high. Another species, *A. aristatum* Boiss. (*A. puellii* Lec. and Lam.), a low annual, is introduced at a few localities.

101. PHALARIS L.

Spikelets laterally compressed, with 1 terminal perfect floret and 2 sterile lemmas below, disarticulating above the glumes, arranged in usually dense spikelike panicles; glumes equal, boat shaped, often winged on the keel; sterile lemmas reduced to 2 small scales (rarely only 1); fertile lemma coriaceous, shorter than the glumes, inclosing the faintly 2-nerved palea.

Annual or perennial erect grasses, with flat blades. Species about 20, in temperate regions of Europe and America. Nine species are found in the United States, four being introduced from Europe.

Type species: *Phalaris canariensis* L.

Phalaris L., Sp. Pl. 54, 1753; Gen. Pl., ed. 5, 29. 1754. Five species are described, *P. canari-*

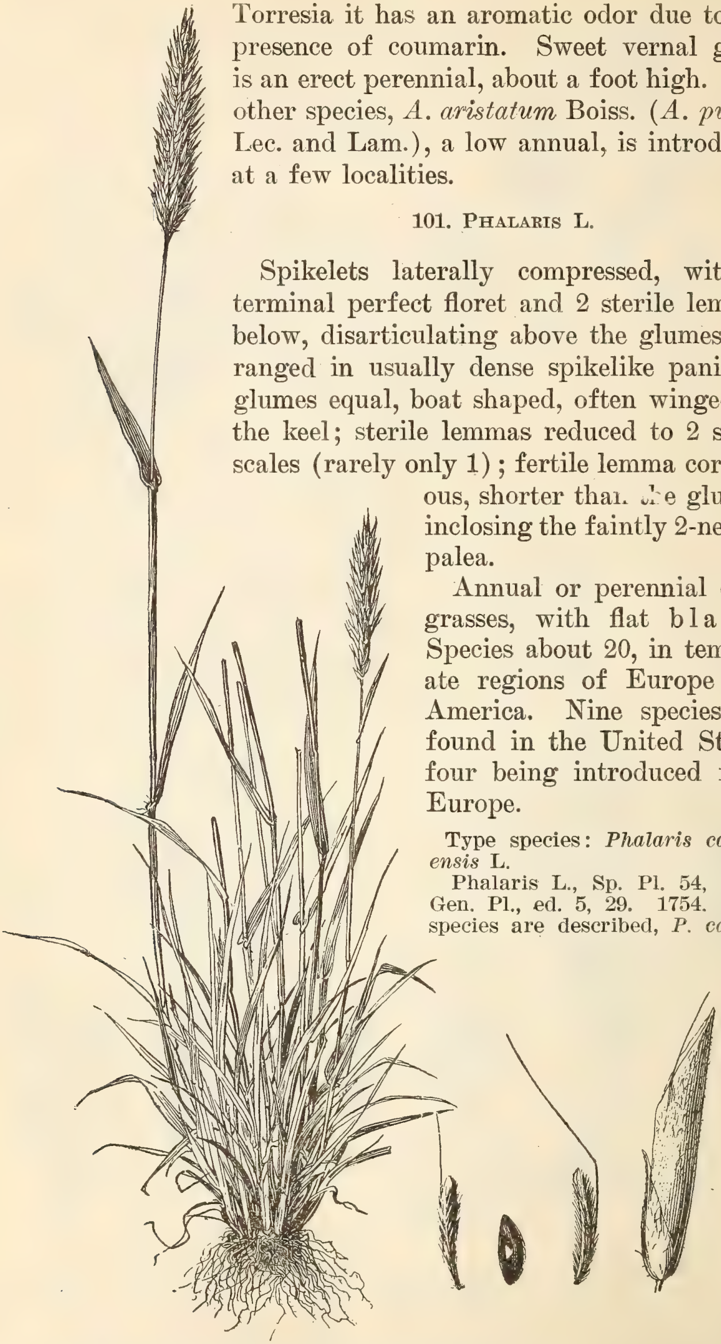
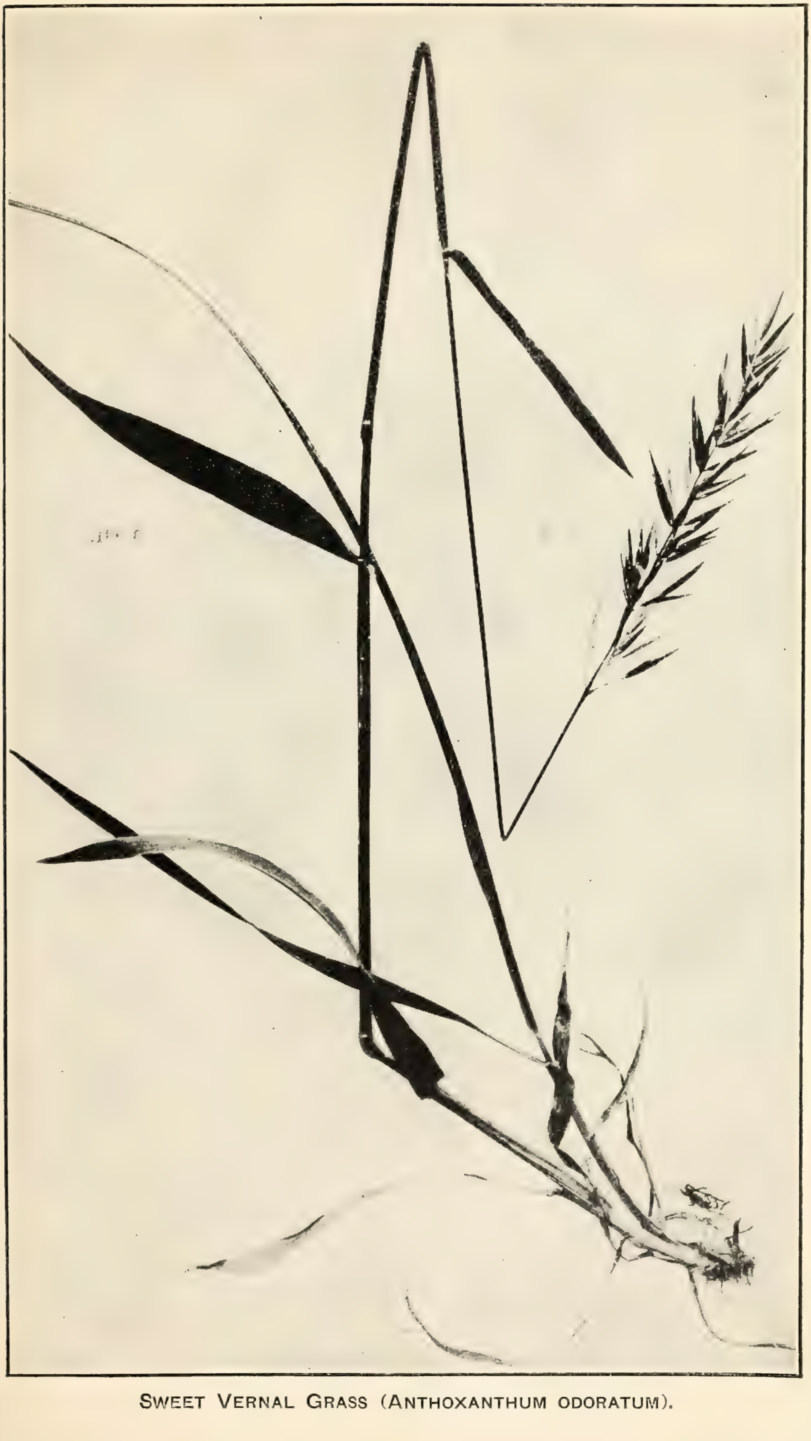
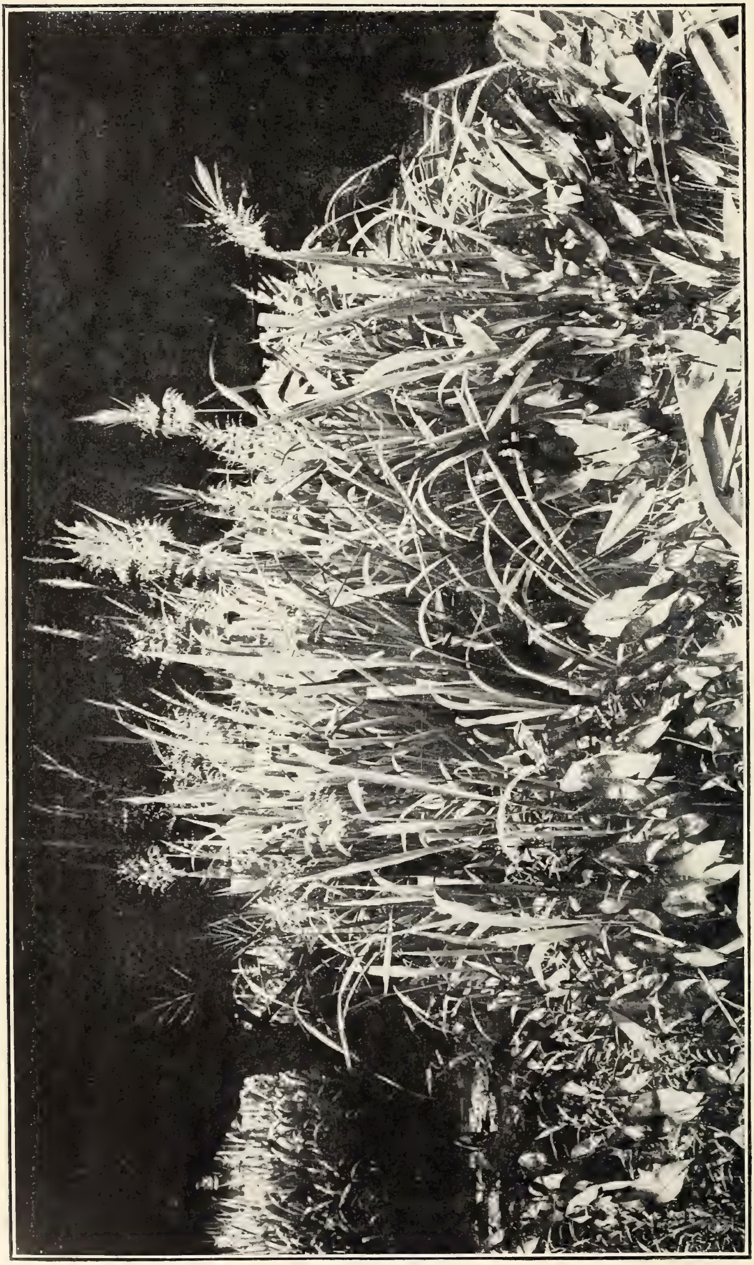


FIG. 120.—Sweet vernal grass, *Anthoxanthum odoratum*. Plant, × ½; spikelet, two sterile lemmas, and fertile floret, × 5.



SWEET VERNAL GRASS (ANTHOXANTHUM ODORATUM).



INDIAN RICE (ZIZANIA PALUSTRIS).

Along the Anacostia River, Washington, D. C. The plants below are pickerel weed (*Pontederia cordata*) at right and arrowleaf (*Sagittaria latifolia*) at left.

ensis, *P. phleoides*, *P. arundinacea*, *P. crucaeformis*, and *P. oryzoides*. The second species is now referred to Phleum, the fourth to Beckmannia, and the fifth to Homalocenchrus. The first species is chosen as the type, because this is the one that best corresponds to the description of the genus in the Genera Plantarum (e. g., gluma obtusa) and is moreover the only one of the five species mentioned above that was known by the name of Phalaris to the older authors, such as Bauhin.

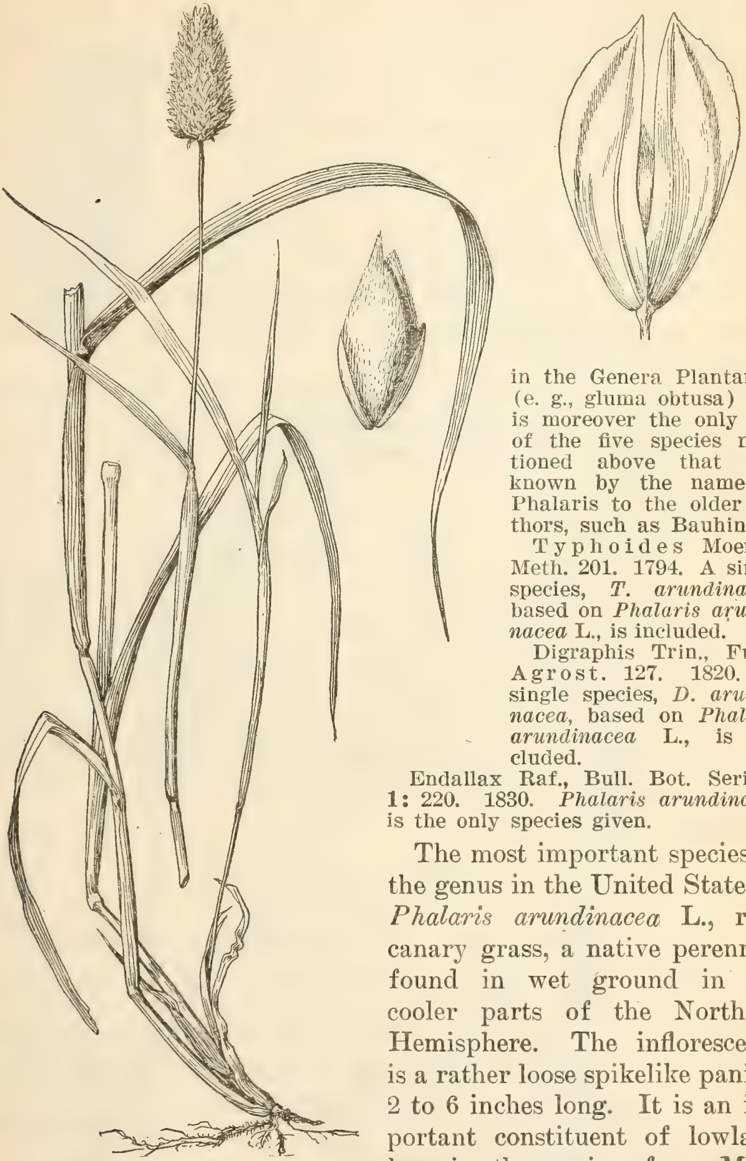


Fig. 121.—Canary grass, *Phalaris canariensis*. Plant, × ½; spikelet and fertile floret with the two sterile lemmas, × 5.

Typhoides Moench, Meth. 201. 1794. A single species, *T. arundinacea*, based on *Phalaris arundinacea* L., is included.

Digraphis Trin., Fund. Agrost. 127. 1820. A single species, *D. arundinacea*, based on *Phalaris arundinacea* L., is included.

Endallax Raf., Bull. Bot. Seringe 1: 220. 1830. *Phalaris arundinacea* is the only species given.

The most important species of the genus in the United States is *Phalaris arundinacea* L., reed canary grass, a native perennial found in wet ground in the cooler parts of the Northern Hemisphere. The inflorescence is a rather loose spikelike panicle 2 to 6 inches long. It is an important constituent of lowland hay in the region from Montana to Wisconsin. A variety (*picta* L.) with blades striped with white is grown for ornament in gardens under the name of ribbon grass or gardener's garters.

Phalaris canariensis L. (fig. 121), canary grass, is an annual with ovoid heads, the large spikelets white with green nerves. This species is introduced from Europe, where it is grown for seed, which furnishes the canary seed of commerce.[1] *Phalaris caroliniana* Walt., a perennial of the southern United States, with oblong compact heads, is sometimes cultivated for winter forage.

9. ORYZEAE, THE RICE TRIBE.

102. ORYZA L.

Spikelets 1-flowered, laterally compressed, disarticulating below the glumes; glumes 2, much shorter than the lemma, narrow; lemma rigid, keeled, 3-nerved, sometimes awned; palea similar to the lemma, narrower, keeled, but with no midnerve on the back, 2-nerved close to the margins.

Annual or sometimes perennial swamp grasses, often tall, with flat blades and spikelets in open panicles. Species about seven, one in tropical America, the others in tropical Africa and Asia.

Type species: *Oryza sativa* L.

Oryza L., Sp. Pl. 333, 1753; Gen. Pl., ed. 5, 155. 1754. A single species, *O. sativa*, is described.

The only important species is *Oryza sativa* L. (fig. 122), or rice. This is cultivated in all tropical and warm countries and is one of the important food plants of the world. There are a large number of varieties, some with awned, some with awnless spikelets. In the United States rice is grown under irrigation on the lowland along the Atlantic coast of the Southern States, especially in South Carolina and Georgia, and more extensively along the Mississippi River in Louisiana and on the prairies of southwestern Louisiana and southeastern Texas.

103. HOMALOCENCHRUS Mieg.
(*Leersia* Swartz.)

Spikelets 1-flowered, strongly compressed laterally, disarticulating from the pedicel; glumes wanting; lemma chartaceous, broad, oblong, boat shaped, usually 5-nerved, the lateral pair of nerves close to the margins, these and the keel often hispid-ciliate, the intermediate nerves sometimes faint; palea as long as the lemma, much narrower, usually 3-nerved, the keel usually hispid-ciliate, the lateral nerves close to the margins, the margins firmly held by the margins of the lemma; stamens six or fewer.

Perennial grasses, usually with creeping rhizomes, with flat, scabrous blades and open panicles, the spikelets nearly sessile along one side of the branchlets. Species ten, tropical and temperate regions; five species in the United States, mostly swamp grasses.

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[1] The commercial seed may also contain seed of *Panicum miliaceum*. The seed of *Phalaris canariensis* is pale yellow, equally convex on both sides, compressed, and somewhat pubescent. The seed of *Panicum miliaceum* is brownish or reddish, much more plump, dorsally flattened on one side, smooth, and faintly nerved.

Type species: *Phalaris oryzoides* L.

Homalocenchrus Mieg, Act. Helv. Phys. Math. **4**: 307. 1760. One species is referred to the genus with certainty, another being doubtfully referred to it. No specific names are used, but under the first there are two citations which appear in the Species Plantarum under *Phalaris oryzoides*.

Leersia Swartz, Prod. Veg. Ind. Occ. 21. 1788. Three species are described, *L. monandra*, *L. hexandra*, and *L. oryzoides*. *Phalaris oryzoides* L., the basis of the third species, is selected as the type, as this is the oldest historically.

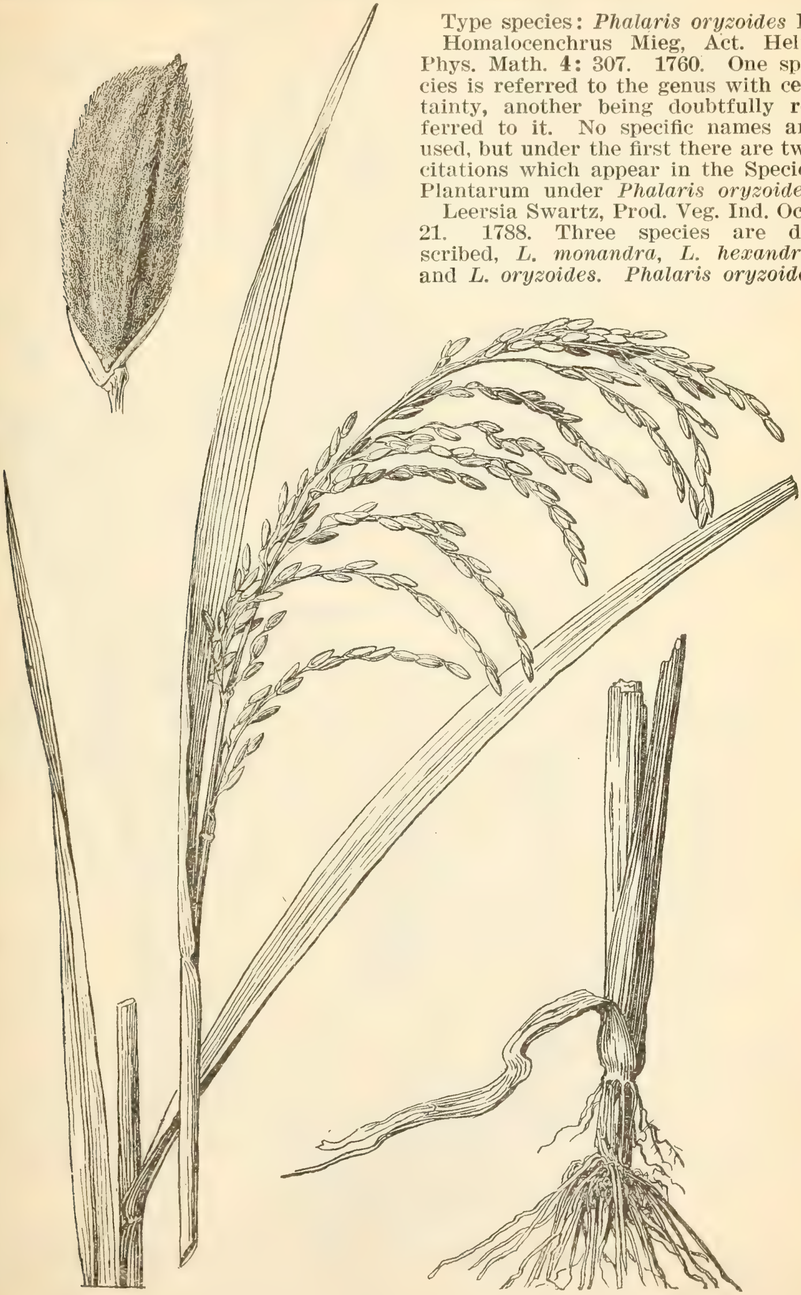

FIG. 122.—Rice, *Oryza sativa*. Plant, × ½; spikelet, × 5.

Endodia Raf., Neogenyt. 4. 1825. Based on *Leersia lenticularis*, the only species mentioned.

Aplexia Raf., Bull. Bot. Seringe 1: 220. 1830. A single species, *Leersia virgata* (probably a misprint for *L. virginica*) is included.

All the species of the United States except *Homalocenchrus monandrus* (Swartz) Kuntze, a plant of rich woods in southern Florida and southern Texas, have creeping rhizomes. Most of them are marsh grasses. *Homalocenchrus monandrus* differs from the other species also in having small glabrous spikelets in which the palea is rounded on the back and lacks the midnerve, as in rice. In the other species the palea is strongly compressed-keeled and appears to represent a bract rather than a prophyllum.

Homalocenchrus virginicus (Willd.) Britton and *H. oryzoides* (L.) Poll. (fig. 123) are common throughout the eastern United States in moist soil, the latter often forming distinct zones of vegetation in marshes. The first has spikelets about 3 mm. long and the main panicle branches solitary; the second has spikelets about 5 mm. long and the lower main panicle branches more than one at the node. These species, because of the very scabrous, adhesive blades, are called rice cut-grass. The species have no economic importance.

10. ZIZANIEAE, THE INDIAN-RICE TRIBE.

104. Zizaniopsis Doell and Aschers.

Spikelets unisexual, 1-flowered, disarticulating from the pedicel, mixed on the same branches of the panicle, the staminate below; first glume wanting; second glume 7-nerved, short-awned in the pistillate spikelets; lemma 3-nerved; palea wanting; stamens six; styles rather long, united; caryopsis obovate, free, coriaceous, smooth and shining, beaked with the persistent style.

Robust perennial marsh grasses, with stout creeping rhizomes, broad flat blades, and large open panicles. Species three; two in South America, one in the United States.

Type species: *Zizania microstachya* Nees.

Zizaniopsis Doell and Aschers.; Doell in Mart. Fl. Bras. 2^2: 12, pl. 3. 1871. A single species described.

The only species in the United States is *Zizaniopsis miliacea* (Michx.) Doell and Aschers. (fig. 124), growing in swamps from Virginia to Florida and Texas. Like *Zizania palustris*, which it somewhat resembles, this species may be gregarious over wide areas. It has no economic importance except as it may furnish shelter and food to water birds.

105. Zizania L.

Spikelets unisexual, 1-flowered, disarticulating from the pedicel; staminate spikelet soft, the first glume wanting, the second 5-nerved, membranaceous, linear, acuminate or awn-pointed; lemma about as long as the glume, 3-nerved; palea wanting; stamens 6; pistillate

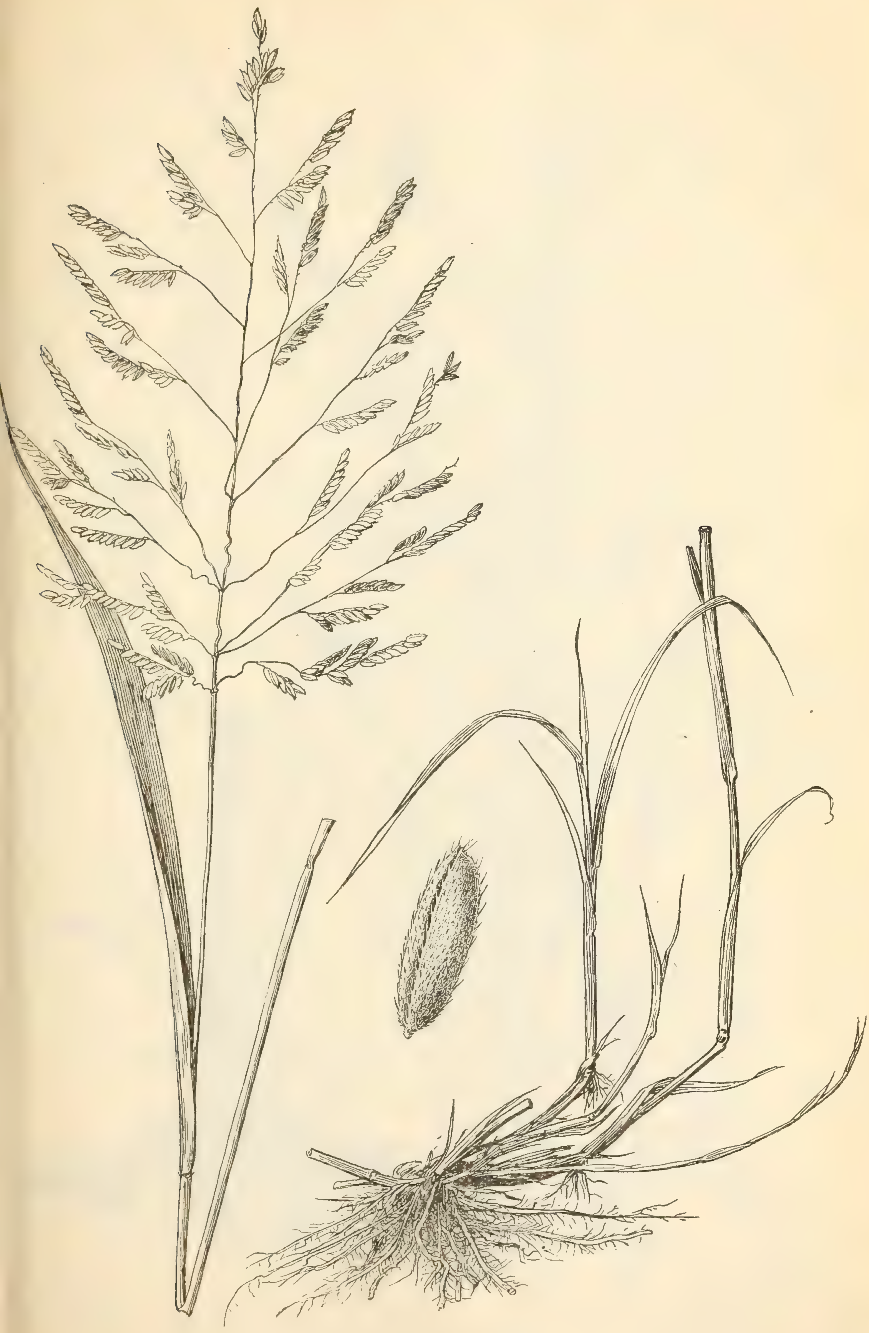

FIG. 123.—Rice cut-grass, *Homalocenchrus oryzoides.* Plant, × ½; spikelet, × 5.

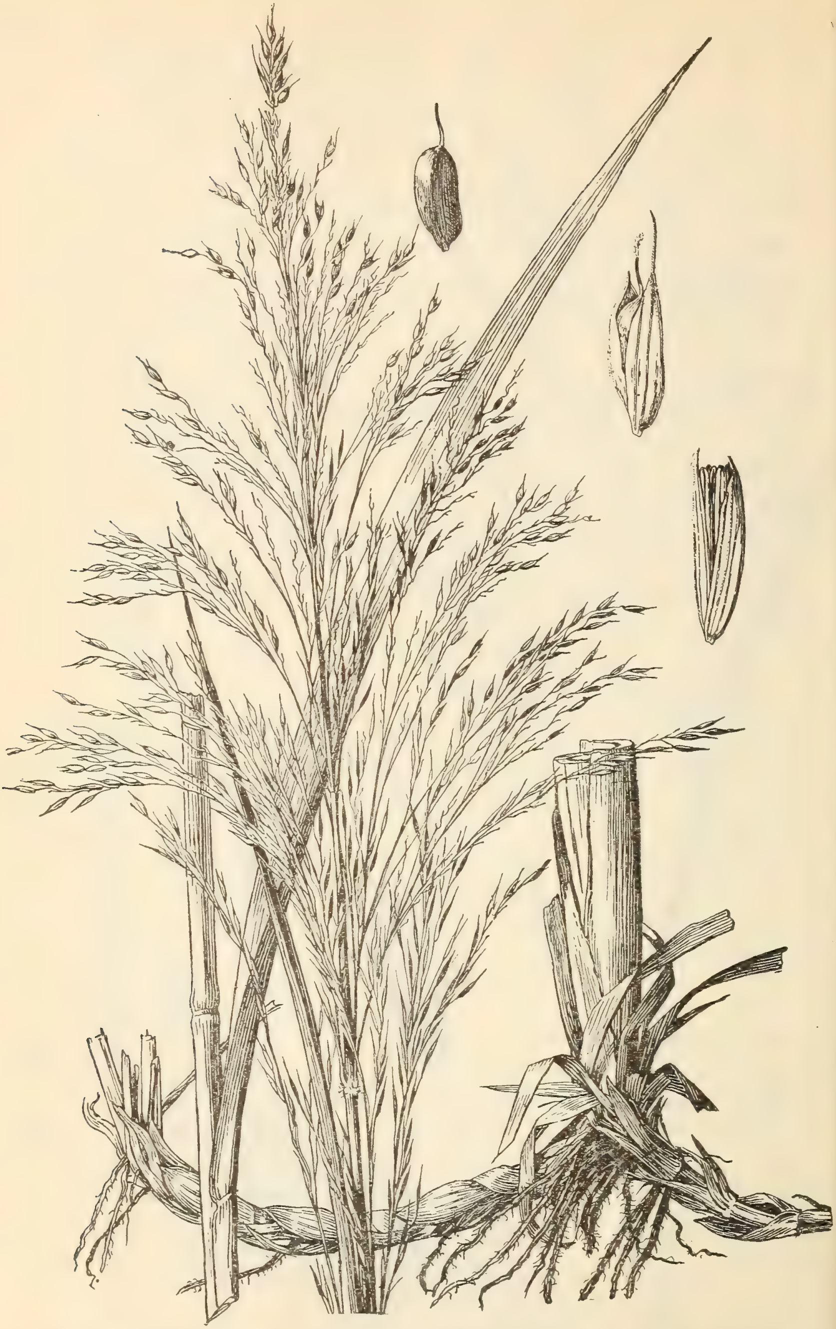

FIG. 124.—*Zizaniopsis miliacea.* Plant, × ½; staminate spikelet, pistillate spikelet, and ripe caryopsis, × 5.

spikelet terete, angled at maturity: glumes wanting; lemma chartaceous, 3-nerved, tapering into a long slender awn; palea 2-nerved, closely clasped by the lemma; grain cylindric, as much as 2 cm. long.

Tall annual or perennial aquatic grasses, with flat blades and large terminal panicles, the lower branches spreading, bearing the pendulous staminate spikelets, the upper branches ascending, at maturity erect, bearing appressed pistillate spikelets, the staminate spikelets early deciduous, the pistillate spikelets tardily deciduous. Species three, one in eastern Asia, two in North America.

Type species: *Zizania aquatica* L.

Zizania L., Sp. Pl. 991, 1753; Gen. Pl., ed. 5. 427. 1754. Linnæus describes two species, *Z. aquatica* and *Z. terrestris*. The citation in the Genera Plantarum is to Gronovius. "Zizania Gron. virg. 189" is given as a synonym by Linnæus under *Z. aquatica;* hence the latter is the type species. The second species, from Malabar, does not belong to Zizania. The director of the Kew Royal Botanic Gardens states that the plate upon which it is based (Rheede, Hort. Malab. **12**: pl. 60) represents *Scleria elata* Thwaites.

Fartis Adans., Fam. Pl. **2**: 37, 557. 1763. Based on Zizania L., which was not Zizania of the ancients.

Hydropyrum Link, Hort. Berol. **1**: 252. 1827. A single species, *H. esculentum*, based on *Zizania palustris* L., is included.

Melinum Link, Handbuch Erkenn. Gewächse **1**: 96. 1829. A single species, *M. palustre,* based on *Zizania palustris* L., is included.

Ceratochaete Lunell, Amer. Midl. Nat. **4**: 214. 1915. A new name proposed for Zizania L., "not Zizanion of the New Testament," which is the tares of Scripture.

Zizania palustris L. (Pl. XVI; fig. 125), Indian or wild rice, is an annual marsh grass growing in the Eastern and Northern States, often over extensive areas. The seeds were used by the aborigines for food and are still used to some extent by some of the northern tribes of Indians. Wild rice is important as a food and shelter for water birds. It is sometimes planted for this purpose in marshes on game preserves. *Zizania aquatica* L. differs in having narrower blades, shorter culms, and less spreading panicles. This form, found from Maine to Minnesota, may be a variety rather than a distinct species.[1] At first Linnæus did not distinguish between the narrow-leaved and broad-leaved forms, but based the name *aquatica* on a specimen[2] of the narrow-leaved form. Later (1771) he described the broad-leaved form as *Zizania palustris*. The Asiatic *Z. latifolia* Turcz. is a perennial with rhizomes and stolons.

106. Luziola Juss.

Spikelets unisexual, 1-flowered, disarticulating from the pedicel, the staminate and pistillate flowers in separate panicles on the same plant; first glume and palea wanting; second glume and lemma about equal, thin, several to many nerved, lanceolate or oblong; stamens several ("6 to 18"); stigmas long, plumose; grain free, globose, smooth.

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[1] See Smiths. Misc. Coll. 68[12]: 35. 1918.

[2] See Hitchcock, Contr. U. S. Nat. Herb. 12: 124. 1908.

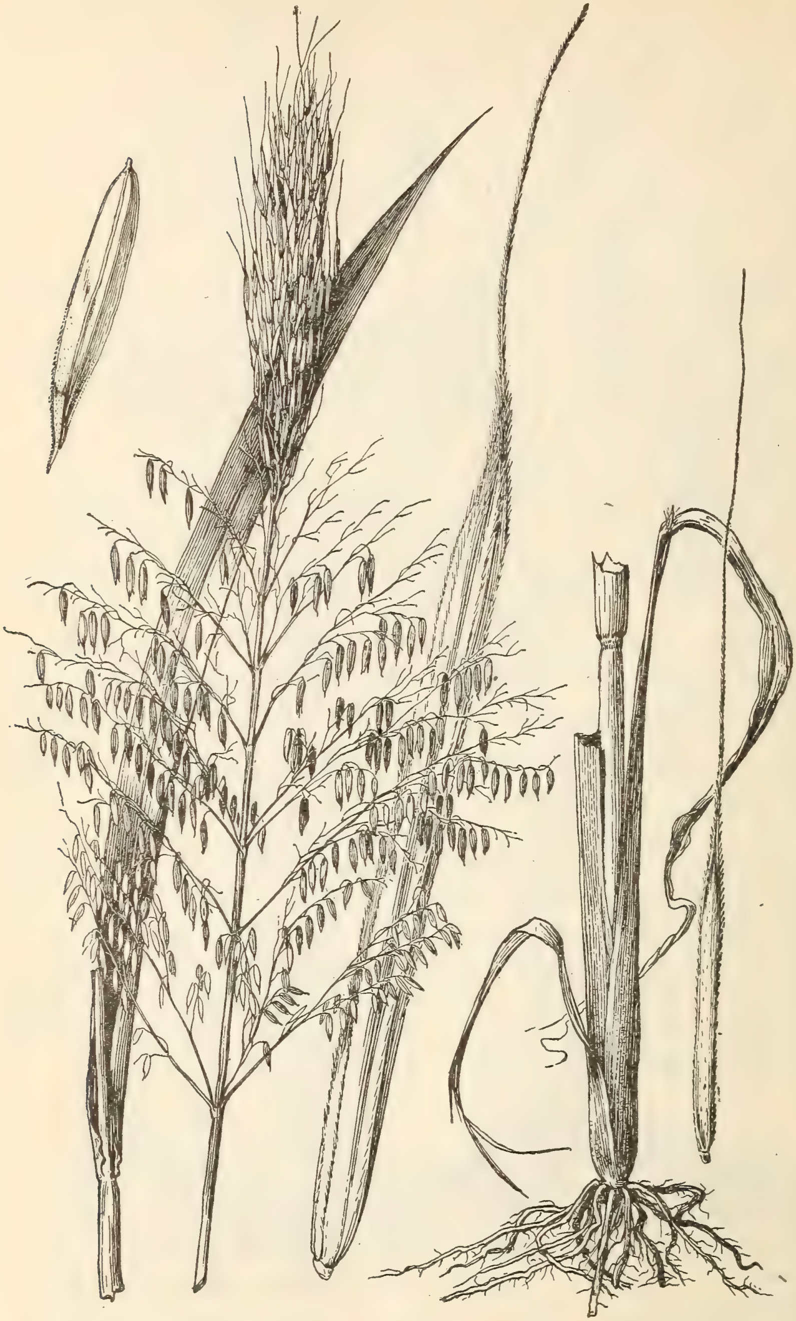

FIG. 125.—Wild rice, *Zizania palustris.* Plant, × ½; pistillate spikelet, × 2; a second view, × 5; staminate spikelet, × 5.

Perennial, creeping, low or delicate grasses, with narrow, flat blades and terminal and axillary panicles. Species about six, in tropical America; two species in the southern United States.

Type species: *Luziola peruviana* Gmel.
Luziola Juss.; Gmel. Syst. Nat. **2**: 637. 1791. The genus is first described by Jussieu in his Genera Plantarum (1789), but no specific name is mentioned. Gmelin assigns a specific name to the species described by Jussieu.

There are two species in the United States, *Luziola peruviana* (fig. 126), with fruit 2 mm. long, and *L. alabamensis* Chapm., with fruit 4 mm. long, the former from Florida to Louisiana and the latter from Alabama. They have no economic importance.

107. Hydrochloa Beauv.

Spikelets unisexual, 1-flowered, awnless, disarticulating from the pedicel, the plants monœcious; staminate spikelets with a thin 7-nerved lemma, a 2-nerved palea, and 6 stamens, the glumes wanting; pistillate spikelets with a thin 3-nerved second glume and 5-nerved lemma, the first glume and the palea wanting, the stigmas long and slender.

A slender, branching, aquatic grass, probably perennial, the leaves floating; staminate flowers in a small few-flowered terminal spike; pistillate flowers in few-flowered spikes in the axils of the leaves. Species one, in the southeastern United States.

Type species: *Hydrochloa carolinensis* Beauv.
Hydrochloa Beauv., Ess. Agrost. 135, pl. 24, f. 4. 1812. Beauvois figures one species, which he names *H. carolinensis*. The species was first described as *Zizania fluitans* Michx., but this name can not be transferred to Hydrochloa because of *H. fluitans* Host.

The spikelets of each sex possess but two bracts. From the appearance and nervation it is assumed that the palea is present in the staminate spikelets and wanting in the pistillate.

Hydrochloa carolinensis Beauv. (fig. 127) is found in streams and ponds from South Carolina to Florida and Louisiana, sometimes in sufficient abundance to become troublesome. It has no economic importance.

Pharus L., Syst. Nat., ed. 10, **2**: 1269. 1759. A tropical American genus, one species of which, *P. latifolius* L., was included by Chapman in his Flora of the Southern States. The locality given is "Orange Lake, Florida (Herb. Thurber)." This West Indian species has not been observed by others in Florida and it should be credited to the United States with doubt.

Rather tall monœcious perennials, with broad elliptic or oblanceolate, petiolate blades and terminal panicles, the large terete pistillate spikelets appressed along the rather few stiffly spreading branches, these disarticulating at the base and easily detached, the uncinate fruits acting like burs.

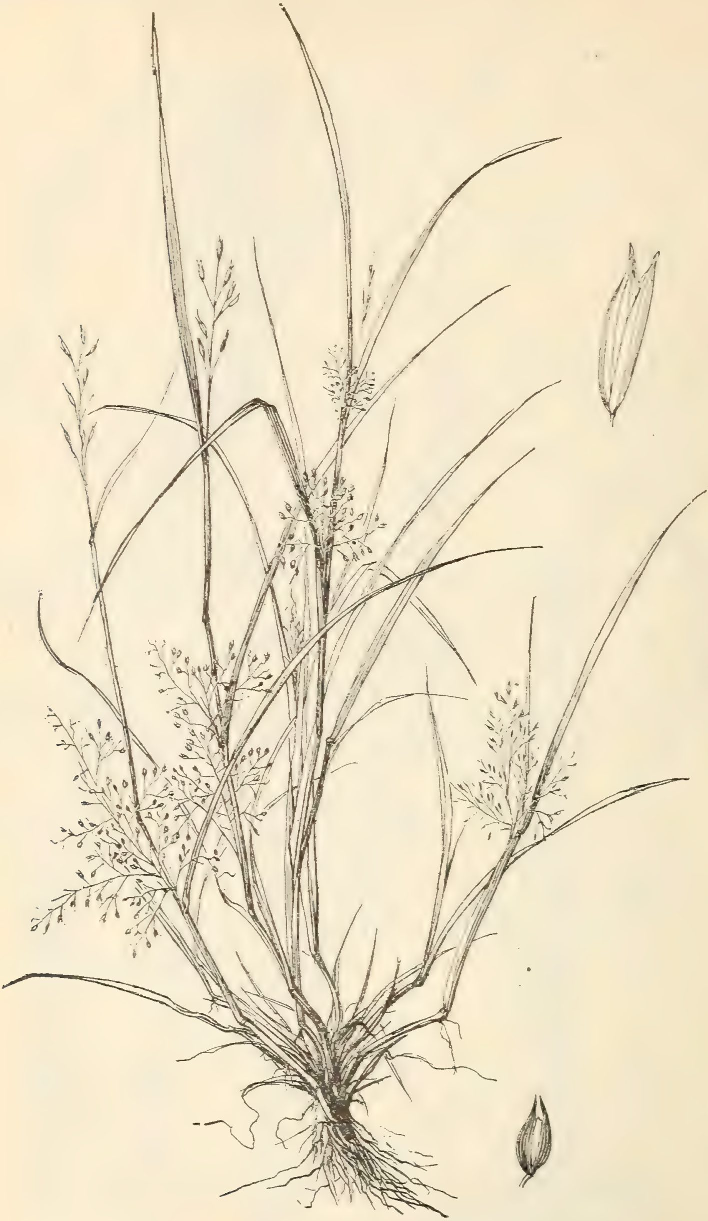

FIG. 126.—*Luziola peruviana.* Plant, × ½; pistillate and staminate spikelets, × 5.

11. MELINIDEAE, THE MOLASSES-GRASS TRIBE.

Melinis Beauv., Ess. Agrost. 54, pl. 11, f. 4. 1812. A Brazilian genus. *Melinis minutiflora* Beauv. (molasses grass) is cultivated in the Tropics for forage. It has been tried in the warmer parts of the South. Molasses grass is a rather stout perennial, with viscid-pubescent foliage, and narrow many-flowered panicles of very small awned spikelets.

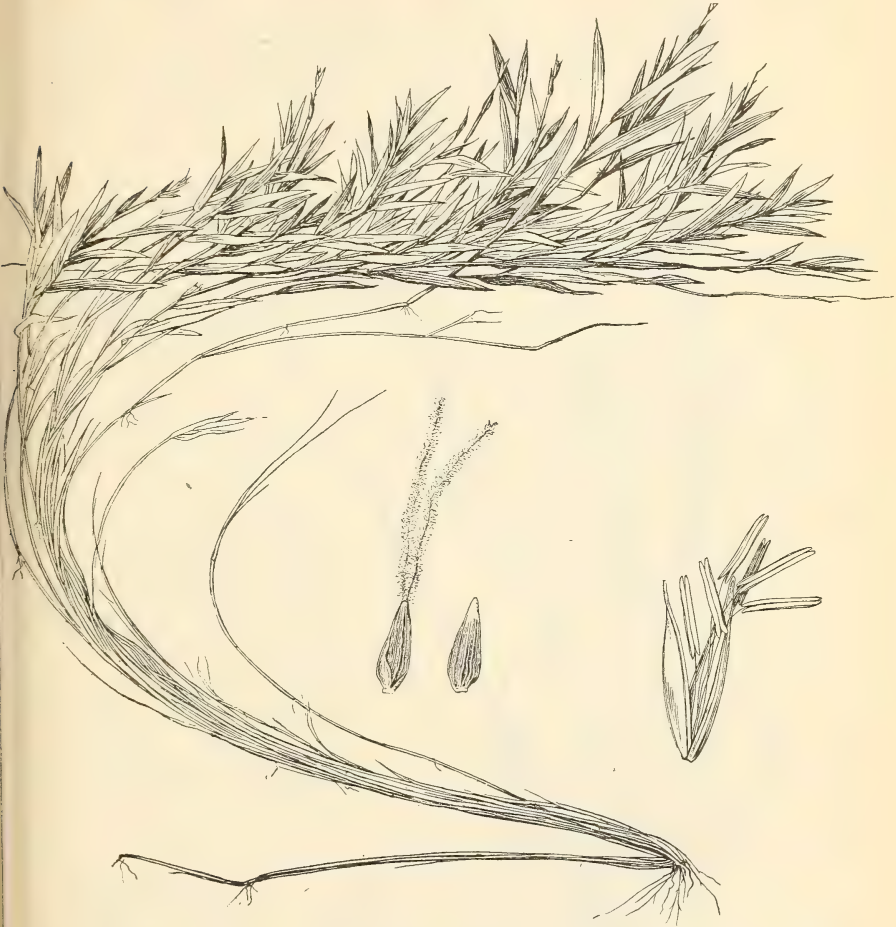

FIG. 127.—*Hydrochloa carolinensis.* Plant, × ½; two views of pistillate spikelet, × 5; staminate spikelet, × 5.

12. PANICEAE, THE MILLET TRIBE.

108. ANTHAENANTIA Beauv.[1]

Spikelets obovoid; first glume wanting; second glume and sterile lemma about equal in length, broad, 5-nerved, villous, the sterile lemma with a small palea and sometimes with a staminate flower; fertile lemma cartilaginous, boat shaped, 3-nerved, subacute, chestnut brown, as long as the glume, the pale margins very narrow, infolding the palea its entire length.

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[1] For a discussion of this and the following genera of this tribe, see Chase, Proc. Biol. Soc. Washington, **19**: 183–192, 1906; **21**: 1–10, 1908; **21**: 175–188, 1908; **24**: 103–160, 1911.

Perennial erect grasses with short creeping rhizomes, narrow, firm, flat blades, the uppermost much reduced, and narrow panicles, the slender branches ascending or appressed. Species two, on the Coastal Plain of the southeastern United States.

Type species: *Phalaris villosa* Michx.

Anthaenantia Beauv., Ess. Agrost. 48, pl. 10, f. 7. 1812. *Phalaris villosa* is the only species mentioned.

Aulaxanthus Ell., Bot. S. C. and Ga. **1:** 102. 1816. Two species are described, *A. ciliatus* and *A. rufus.* The first, which is the same as *Anthaenantia villosa,* is accepted as the type.

Aulaxia Nutt., Gen. Pl. **1:** 47. 1818. Nuttall changes Elliott's name Aulaxanthus to Aulaxia.

Anthaenantia villosa (Michx.) Beauv. (fig. 128), with comparatively short, spreading blades and usually pale panicle, and *A. rufa* (Ell.) Schult., with long erect blades and usually purple panicle, are of no economic importance.

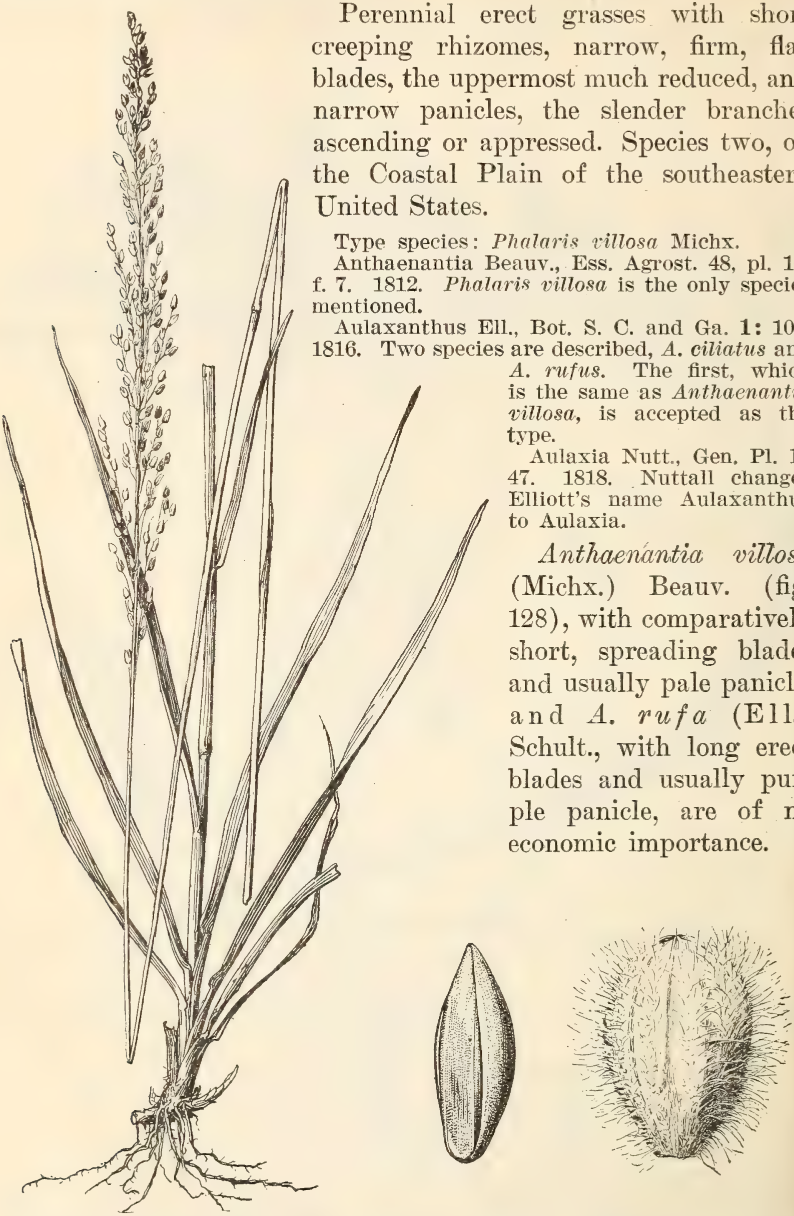

FIG. 128.—*Anthaenantia villosa.* Plant, × ½; spikelet and fertile floret, × 10.

109. VALOTA Adans.

Spikelets lanceolate, in pairs, short-pediceled, in two rows along one side of a narrow rachis; first glume minute, glabrous;

second glume and sterile lemma about as long as the fruit, 3 to 5 nerved, copiously silky; fertile lemma cartilaginous, lanceolate, acuminate, usually brown, the flat white hyaline margins broad.

Perennial grasses, the slender racemes erect or nearly so, aggregate along the upper part of the main axis, forming a white or brownish woolly panicle. Species about 12, in the warmer parts of America and in Australia; 3 species in the southern United States.

Type species: *Andropogon insularis* L.

Valota Adans., Fam. Pl. **2**: 495. 1763. The citation given by Adanson is to "Sloan. t. 14. f. 2." which is also given by Linnæus under his *Andropogon insularis*,[1] which fixes this species as the type.

Trichachne Nees, Agrost. Bras. 85. 1829. Nees describes five species, the first of which, *T. insularis*, based on *Andropogon insularis*, is taken as the type.

Valota is closely allied to Syntherisma, differing chiefly in the acuminate fruit and the silky spikelets.

Valota insularis (L.) Chase (*Panicum lanatum* Rottb., *P. leucophaeum* H. B. K.) (fig. 129), common in the American Tropics, with brown or tawny inflorescence, is found in southern Florida. *Valota hitchcockii* Chase, with short blades and short-pubescent spikelets is a rare species from Texas and Mexico. *Valota saccharata* (Buckl.) Chase (*Panicum lachnanthum* Torr.), with copiously long, silky white spikelets, is common in the Southwestern States on rocky soil. The first-mentioned species is not relished by cattle and in the West Indies is called sour-grass. The third species is a constituent of the ranges of the Southwest, but furnishes only fair forage.

110. SYNTHERISMA Walt., the crab-grasses.
(*Digitaria* Hall., not Heist.)

Spikelets solitary or in twos or threes, subsessile or short-pediceled, alternate in two rows on one side of a three-angled winged or wingless rachis; spikelets lanceolate or elliptic, plano-convex; first glume minute or wanting; second glume equaling the sterile lemma or shorter; fertile lemma cartilaginous, the hyaline margins pale.

Annual or sometimes perennial, erect or prostrate grasses, the slender racemes digitate or somewhat scattered, but aggregate along the upper part of the culms. Species about 60, in the warmer parts of the world; 12 species in the United States, mostly in the southeastern part.

Type species: *Syntherisma praecox* Walt.

Digitaria Hall., Stirp. Helv. **2**: 244, 1768, not Adans., 1763, nor Heist., 1759. Haller describes two species. No specific names are used, but the first species is associable by citation with *Panicum sanguinale* L. (*Syntherisma sanguinalis*) and the second with *Panicum dactylon* L. (*Capriola dactylon*). The first is chosen as the type.

Syntherisma Walt., Fl. Carol. 76. 1788. Walter describes three species, *S. praecox*, *S. serotina*, and *S. villosa*. The first of these is selected as the type. This is the same as *S. sanguinalis*.

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[1] Syst. Nat., ed. 10, **2**: 1304. 1759.

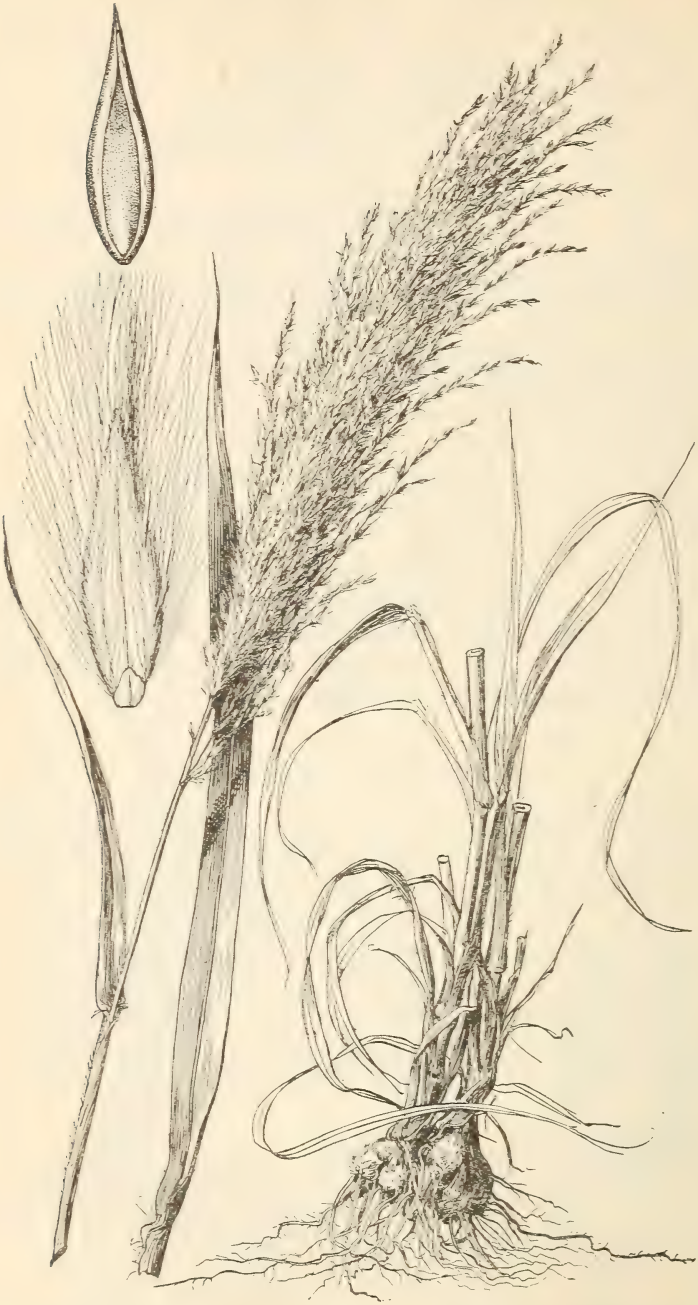

FIG. 129.—Sour-grass, *Valota insularis*. Plant, × ½; spikelet and fertile floret, × 10.

Syntherisma is included in Panicum by some botanists and in Paspalum by others. It differs from both in the cartilaginous rather than indurate fruit and in the flat, white, hyaline margins of the lemma.

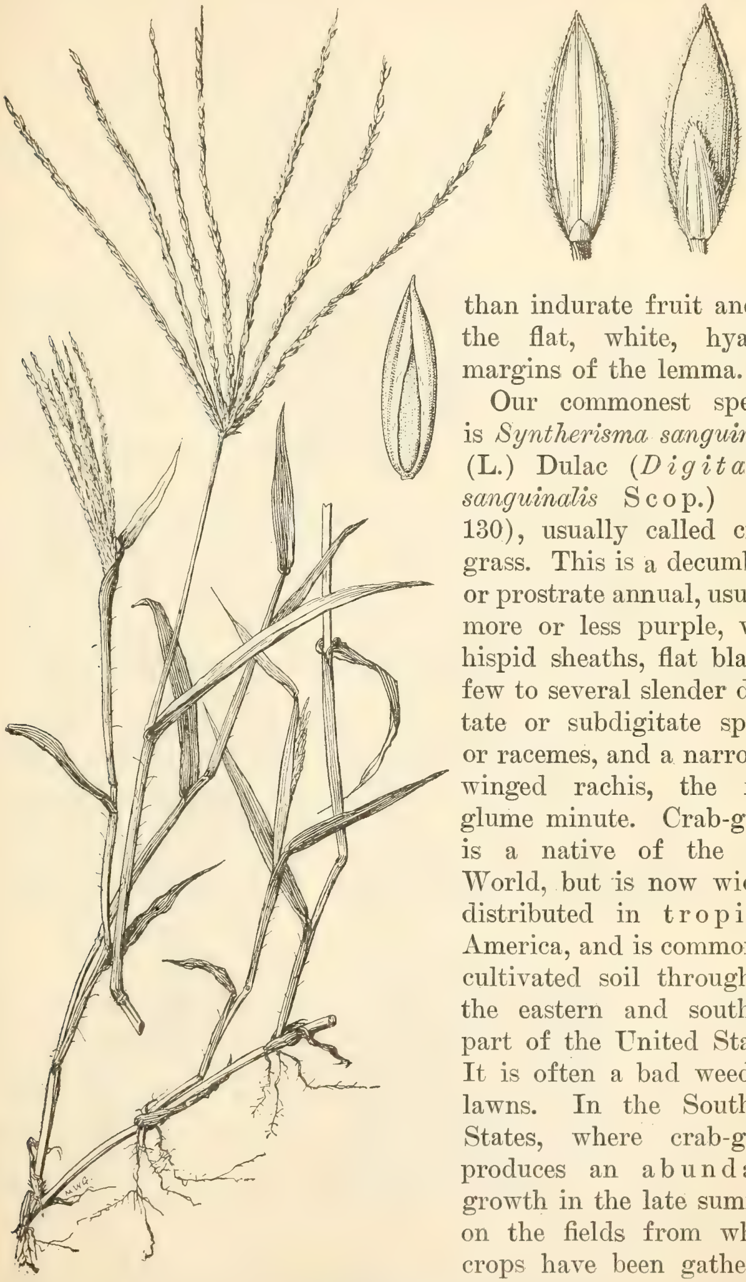

FIG. 130.—Crab-grass, *Syntherisma sanguinalis*. Plant, × ½; two views of spikelet and fertile floret, × 10.

Our commonest species is *Syntherisma sanguinalis* (L.) Dulac (*Digitaria sanguinalis* Scop.) (fig. 130), usually called crab-grass. This is a decumbent or prostrate annual, usually more or less purple, with hispid sheaths, flat blades, few to several slender digitate or subdigitate spikes or racemes, and a narrowly winged rachis, the first glume minute. Crab-grass is a native of the Old World, but is now widely distributed in tropical America, and is common in cultivated soil throughout the eastern and southern part of the United States. It is often a bad weed in lawns. In the Southern States, where crab-grass produces an abundant growth in the late summer on the fields from which crops have been gathered, it is utilized for forage and is sometimes cut for hay.

Syntherisma ischaemum (Schrad.) Nash (*Digitaria humifusa* Pers., *Panicum glabrum* Gaud.), also introduced, is darker green and glabrous, and has dark pubescent spikelets, the first glume wanting. This is a common weed in lawns. *Syntherisma filiformis* (L.) Nash is an erect native annual with erect racemes, the rachis not winged. Several other species are found in Florida. Nearly all the species of Syntherisma are weedy grasses or tend to become weeds.

For a revision of the species of Syntherisma found in the United States, see Nash, Bull. Torrey Club **25**: 289–303. 1898.

111. LEPTOLOMA Chase.

Spikelets on slender pedicels; first glume minute or obsolete; second glume 3-nerved, nearly as long as the 5 to 7 nerved sterile lemma, a more or less prominent stripe of appressed silky hairs down the internerves and margins of each, the sterile lemma empty or inclosing a minute nerveless rudimentary palea; fertile lemma cartilaginous, elliptic, acute, brown, the delicate hyaline margins inclosing the palea.

Perennial branching grasses, with brittle culms, felty pubescent at base, flat blades, and open or diffuse panicles, these breaking away at maturity, becoming tumbleweeds. Species four; one in the United States, the others in Australia.

Type species: *Panicum cognatum* Schult.
Leptoloma Chase, Proc. Biol. Soc. Washington **19**: 191. 1906. The type is designated.

The only species found in our country is *Leptoloma cognatum* (Schult.) Chase (*Panicum autumnale* Bosc, *P. divergens* Muhl.) (fig. 131) growing in sandy soil from New England to Florida and from Minnesota to Texas. This genus differs from Syntherisma chiefly in the form of the inflorescence, being an open panicle rather than an aggregation of slender spikes. It is of no economic importance.

112. STENOTAPHRUM Trin.

Spikelets embedded in one side of an enlarged and flattened corky rachis disarticulating at maturity, the spikelets remaining attached; first glume small; second glume and sterile lemma about equal, the latter with a palea or staminate flower; fertile lemma chartaceous.

Creeping stoloniferous perennials, with short flowering stems, rather broad and short obtuse blades, and terminal and axillary spikes. Species about five; islands of the Pacific; one in the southern United States.

Type species: *Panicum dimidiatum* L.
Stenotaphrum Trin., Fund. Agrost. 175. 1820. A single species is mentioned, *S. glabrum* Trin., based on *Rottboellia dimidiata* L., which in turn is based on *Panicum dimidiatum* L.

Our species is *Stenotaphrum secundatum* (Walt.) Kuntze (*S. americanum* Schrank) (fig. 132), found near the coast from North Carolina to Florida and Texas, and southward, growing especially in alluvial or mucky soil. It is cultivated as a lawn grass in the coastal cities under the name of St. Augustine grass. The lawns of this grass have a coarse texture but are otherwise satisfactory. The grass is propagated by setting out cuttings or pieces of the stolons bearing shoots.

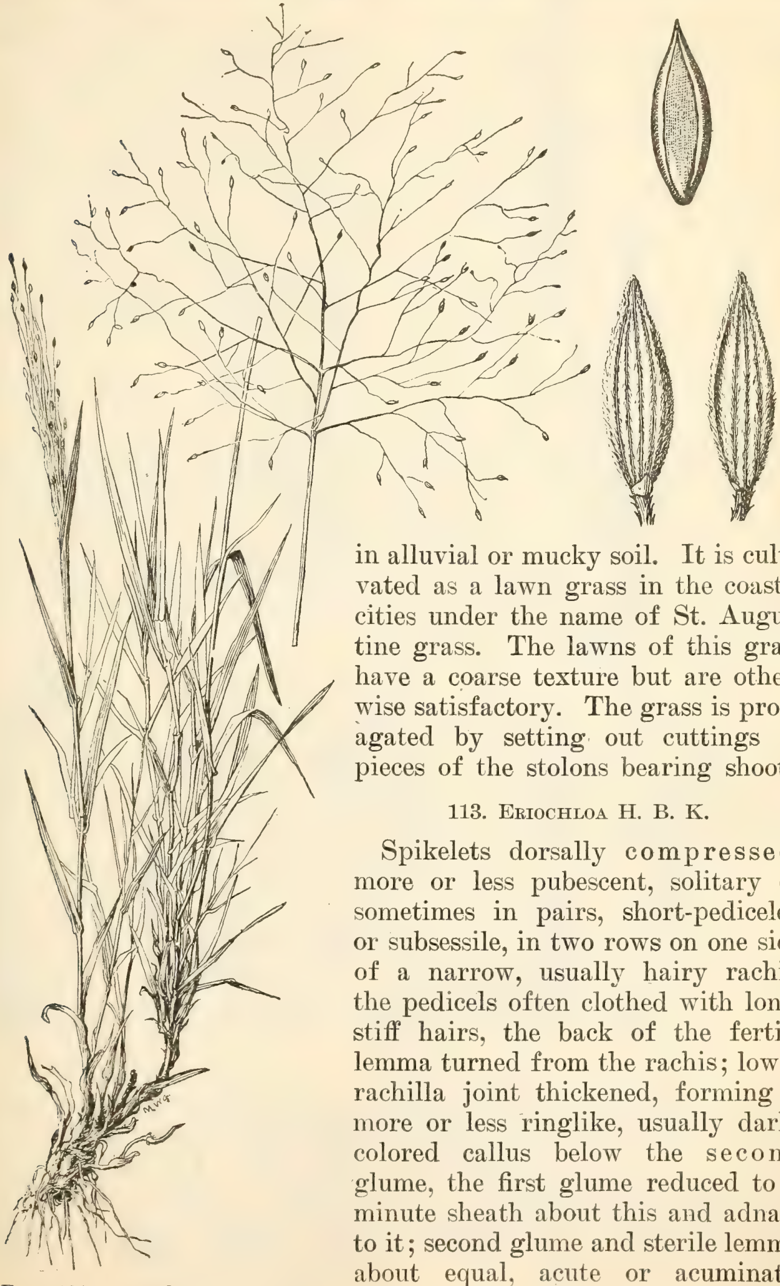

FIG. 131.—*Leptoloma cognatum.* Plant, × ½; two views of spikelet and fertile floret, × 10.

113. ERIOCHLOA H. B. K.

Spikelets dorsally compressed, more or less pubescent, solitary or sometimes in pairs, short-pediceled or subsessile, in two rows on one side of a narrow, usually hairy rachis, the pedicels often clothed with long, stiff hairs, the back of the fertile lemma turned from the rachis; lower rachilla joint thickened, forming a more or less ringlike, usually dark-colored callus below the second glume, the first glume reduced to a minute sheath about this and adnate to it; second glume and sterile lemma about equal, acute or acuminate, the lemma usually inclosing a hyaline palea or sometimes a staminate flower: fertile lemma indurate, minutely papillose-rugose, mucronate or awned, the awn often readily deciduous, the margins slightly inrolled.

Annual or perennial, often branching grasses, with terminal panicles consisting of several or many spreading or appressed racemes, usually rather closely arranged along the main axis. Species about 15, in the warmer parts of the world, mostly in America; 6 species in the United States, in the Southern and Southwestern States.

Type species: *Eriochloa distachya* H. B. K.

Eriochloa H. B. K., Nov. Gen. and Sp. **1:** 94, pls. 30 and 31. 1816. Two species are described, *E. distachya* and *E. polystachya*, and both are figured. The first is chosen as the type.

Helopus Trin., Fund. Agrost. 103, pl. 4. 1820. The only species mentioned is *H. pilosus*, which is the same as *Eriochloa punctata.* Trinius incorrectly cites *Milium ramosum* Retz. as a synonym of *Helopus pilosus.*

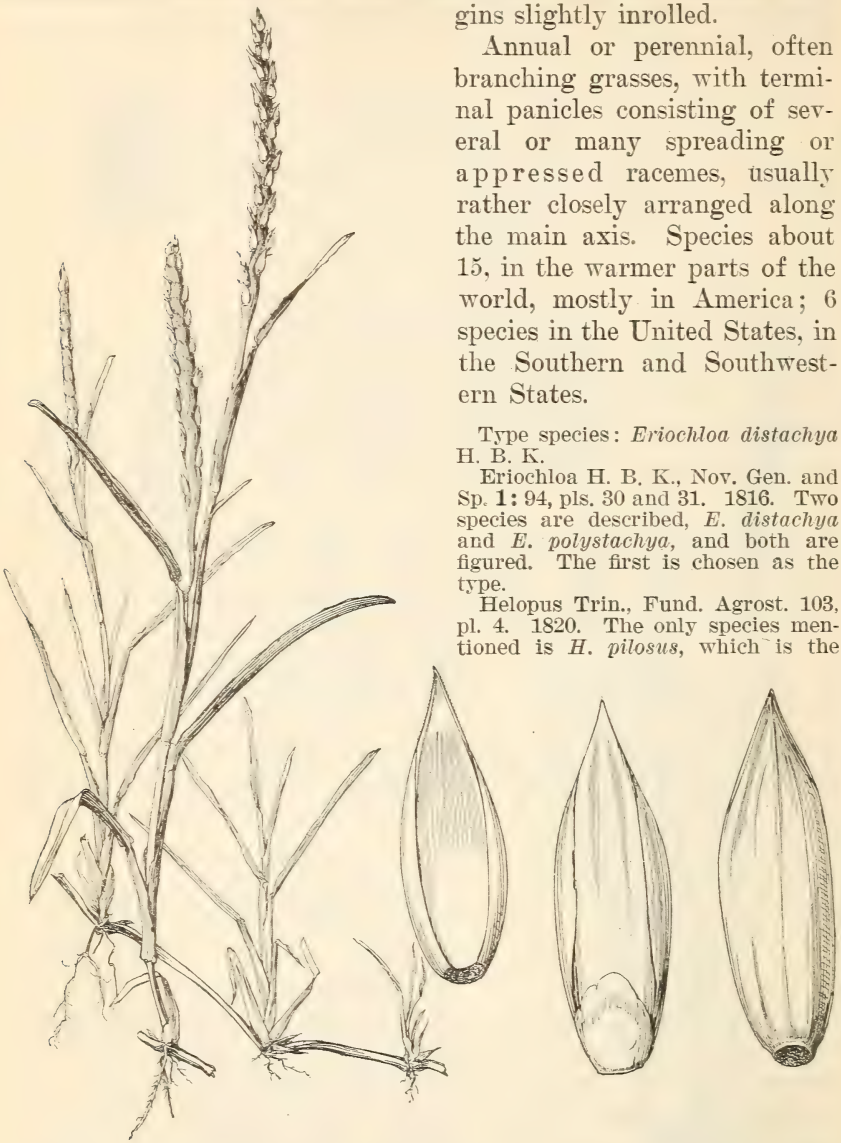

Fig. 132.—St. Augustine grass, *Stenotaphrum secundatum.* Plant, × ½; two views of spikelet and fertile floret, × 10.

Oedipachne Link, Hort. Berol. **1:** 51. 1827. The only species mentioned is *Milium punctatum* L. (*Eriochloa punctata* (L.) Hamilt.), upon which *Oedipachne punctata* is based.

Our commonest species is *Eriochloa acuminata* (Presl) Kunth, an annual, 1 to 2 feet tall, with spikelets about 5 mm. long, the fertile lemma apiculate. This is found from Kansas to Texas and Arizona, in open ground, often a weed in cultivated soil. In some books this is called *E. polystachya* H. B. K., a species described from Ecuador. A West Indian species, *E. punctata* (L.) Hamilt. (fig. 133), extends into Louisiana and Texas.

Our species appear to be of no agricultural importance. One species of the West Indies (*E. subglabra*), called in Porto Rico malojilla, is used for forage. This has been tried along the Gulf coast from Florida to southern Texas, and has given excellent results in southern Florida and at Biloxi, Miss. Carib grass, as it is proposed to call this species, is similar in habit to Para grass, producing runners, but less extensively, and is suited to grazing and will furnish a good quality of hay. It will not withstand either cold or drought.

114. BRACHIARIA (Trin.) Griseb.

Spikelets dorsally compressed, solitary, rarely in pairs, subsessile, in two rows on one side of a 3-angled, sometimes narrowly winged rachis, the first glume turned toward the axis; first glume short or nearly as long as the spikelet; second glume and sterile lemma about equal, 5 to 7 nerved, the lemma inclosing a hyaline palea and sometimes a staminate flower; fertile lemma indurate, usually papillose-rugose, the margins inrolled, the apex rarely mucronate or bearing a short awn.

Annual or perennial, branching and spreading grasses, with linear blades and terminal inflorescence consisting of several spreading or appressed racemes along a common axis. Species about 15, in the warmer regions of both hemispheres; 3 species in the United States, 2 native along our southern border, 1 introduced.

Type species: *Panicum erucaeforme* J. E. Smith.

Brachiaria Griseb., in Ledeb. Fl. Ross. 4: 469. 1853. Only one species is mentioned, *B. erucaeformis.*

From those species of Panicum with spikelets in one-sided spike-like racemes, this genus differs in having the spikelets in the reverse position relative to the rachis, that is, with the first glume toward the rachis.

The three species, none of which has economic importance, are *Brachiaria erucaeformis* (J. E. Smith) Griseb., an annual, with pubescent spikelets, occasionally introduced from Europe, *B. platyphylla* (Griseb.) Nash (fig. 134), an annual, with glabrous spikelets, growing in Louisiana and Texas, and *B. ciliatissima* (Buckl.) Chase (*Panicum ciliatissimum* Buckl.), a perennial, with silky spikelets, growing in Arkansas and Texas.

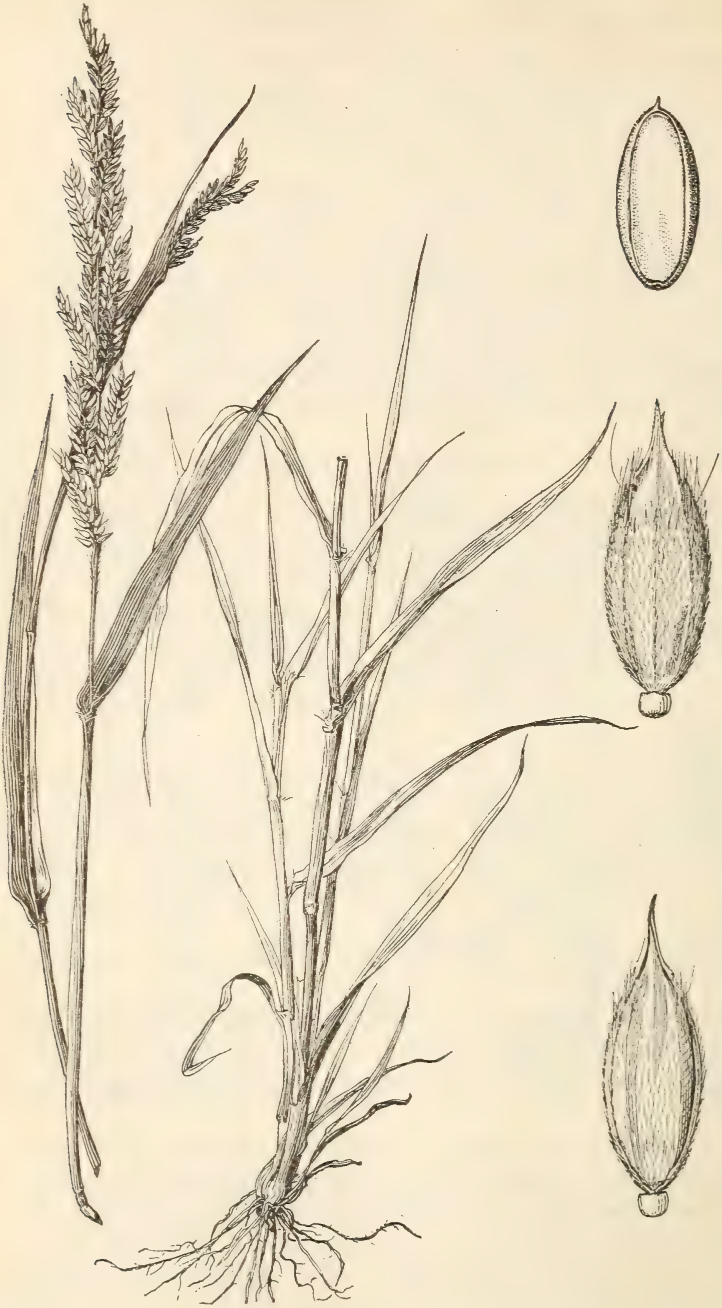

Fig. 133.—*Eriochloa punctata.* Plant, × ½; two views of spikelet and fertile floret, × 10.

115. AXONOPUS Beauv.

(*Anastrophus* Schlecht.)

Spikelets depressed biconvex, not turgid, oblong, usually obtuse, solitary, sessile, and alternate, in two rows on one side of a 3-angled rachis, the back of the fertile lemma turned from the axis; first glume wanting; second glume and sterile lemma equal, the lemma without a palea; fertile lemma and palea indurate, the lemma oblong-elliptic, usually obtuse, the margins slightly inrolled.

Stoloniferous or tufted perennials, rarely annuals, with usually flat or folded, abruptly rounded or somewhat pointed blades, and few or numerous, slender, spikelike racemes, digitate or racemose along the main axis. Species about 30, tropical America, 1 or 2 introduced into the Tropics of the Old World; 2 species in the United States, in moist soil in the Southeastern States.

Type species: *Milium compressum* Swartz.

Axonopus Beauv., Ess. Agrost. 12, 154. 1812. Beauvois mentions several diverse species that belong to his new genus, the first being *Milium compressum*, which

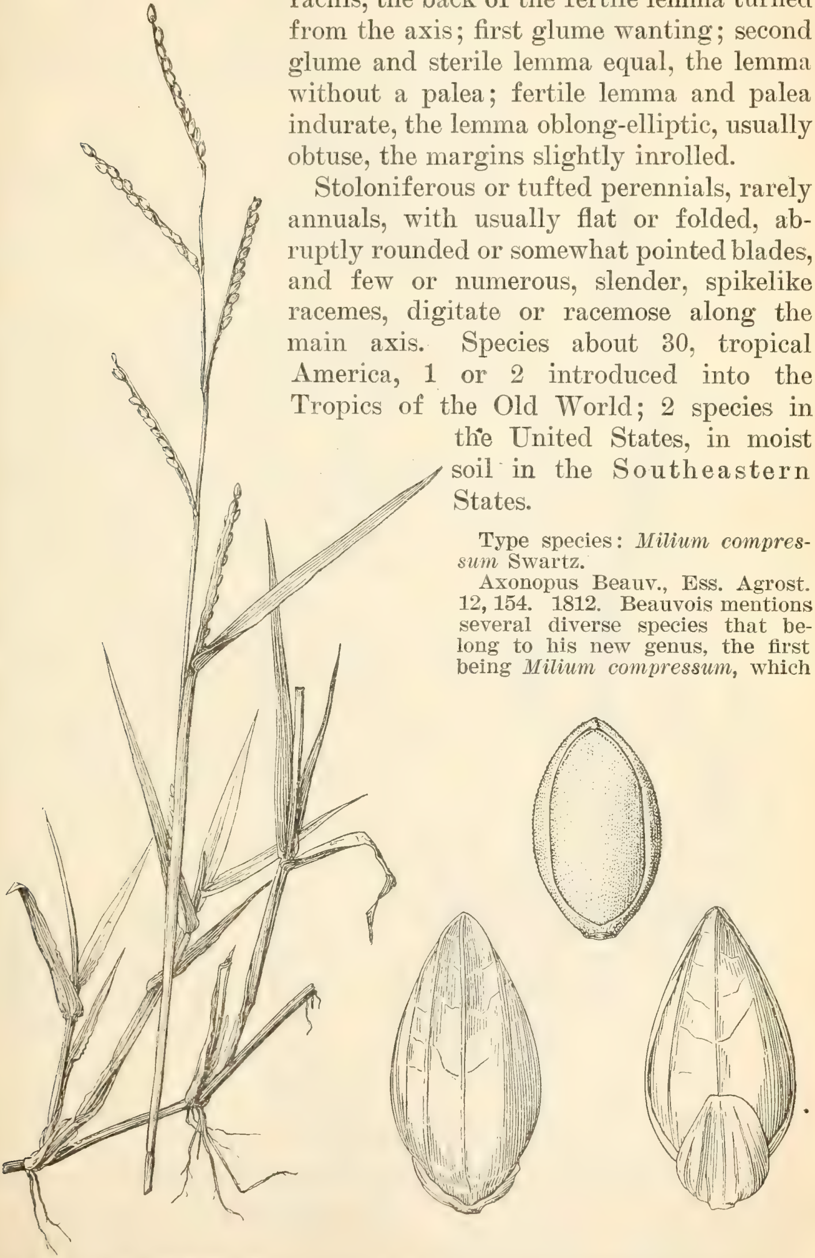

FIG. 134.—*Brachiaria platyphylla*. Plant, × ½; two views of spikelet and fertile floret, × 10.

is chosen as the type, since it is the only species that agrees with his description of the genus in having solitary spikelets. The other species that he mentions are now referred to other genera, *Milium digitatum* to Syntherisma, *M. cimicinum* to Coridochloa, *M. paniceum* to Syntherisma. In a subsequent paragraph the author briefly describes a new species. *A. aureus*, which he thinks ought to belong to this genus. Nash[1] selects *A. aureus* as the type of Axonopus.

Cabrera Lag., Gen. and Sp. Nov. 5. 1816. The type is *C. chrysoblepharis* Lag., the only species mentioned. To this group belongs *Axonopus aureus* mentioned above.

Anastrophus Schlecht., Bot. Zeit. **8**: 681. 1850. The type is *Paspalum platyculmum* Du Petit-Thou., the first of several species referred to the genus. This is probably the same as *Axonopus compressus*, or at least closely allied to that species.

Lappagopsis Steud., Syn. Pl. Glum. **1**: 112. 1854. The type is *L. bijuga* Steud., the only species described.

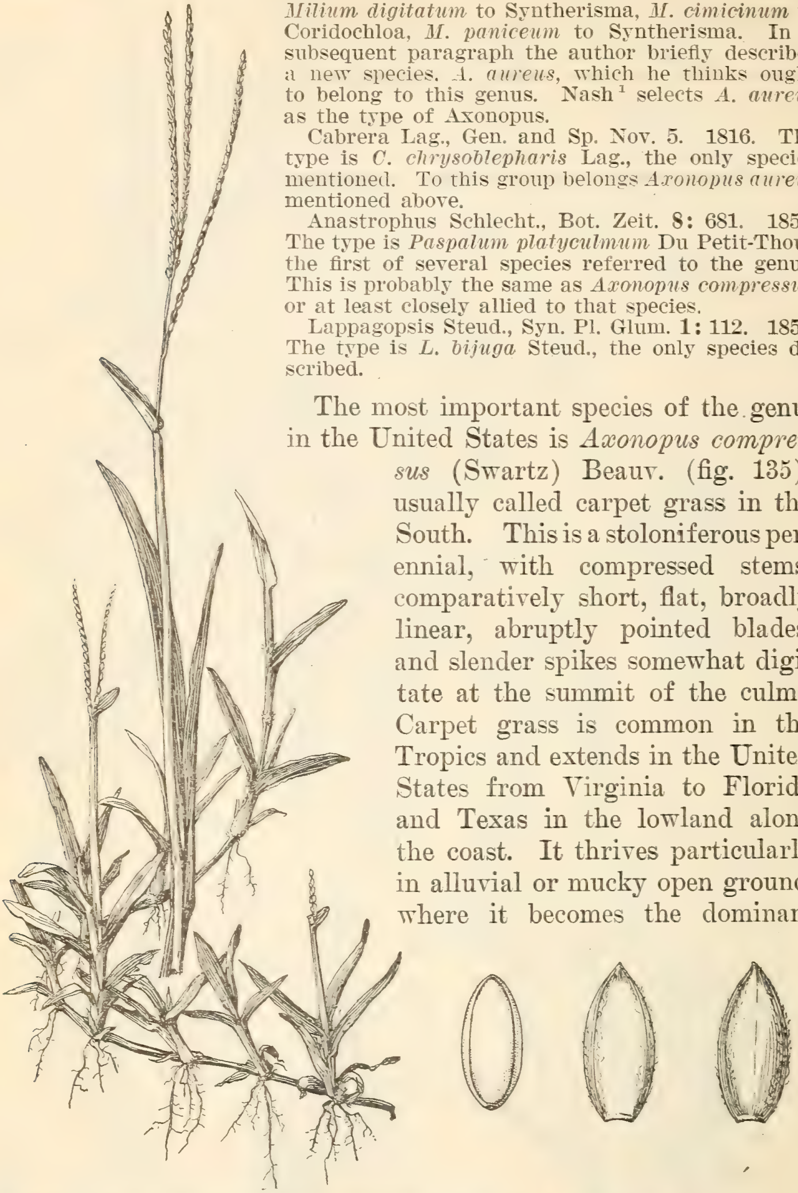

FIG. 135.—Carpet grass, *Axonopus compressus*. Plant, × ½; two views of spikelet and fertile floret, × 10.

The most important species of the genus in the United States is *Axonopus compressus* (Swartz) Beauv. (fig. 135), usually called carpet grass in the South. This is a stoloniferous perennial, with compressed stems, comparatively short, flat, broadly linear, abruptly pointed blades, and slender spikes somewhat digitate at the summit of the culms. Carpet grass is common in the Tropics and extends in the United States from Virginia to Florida and Texas in the lowland along the coast. It thrives particularly in alluvial or mucky open ground, where it becomes the dominant grass. Carpet grass is the predominant pasture grass in the region mentioned, but is of little importance on sandy soil and does not thrive on the uplands. In the region where it thrives as a pasture grass it may be utilized as a lawn grass. For this purpose it is propagated by setting out pieces of the stolons. It soon spreads and occupies the space between.

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[1] N. Amer. Fl. **17**: 165. 1912.

A second species of the genus, *A. furcatus* (Flügge) Hitchc., is found over about the same range as the preceding, but confined to the United States. This is infrequent and is usually of no economic importance, but is a valuable pasture grass in the Kissimmee region, Fla. It is distinguished by its larger spikelets, 4 to 6 mm. long.

116. REIMAROCHLOA Hitchc.
(*Reimaria* of authors.)

Spikelets strongly dorsally compressed, lanceolate, acuminate, rather distant, subsessile, and alternate in two rows along one side of a narrow, flattened rachis, the back of the fertile lemma turned toward it; both glumes wanting, or the second sometimes present in the terminal spikelet; sterile lemma about equaling the fruit, the sterile palea obsolete; fertile lemma scarcely indurate, faintly nerved, acuminate, the margins inrolled at the base only, the palea free nearly half its length.

Spreading or stoloniferous perennials, with flat blades and slender spikes, these subdigitate or racemose along the upper part of the culm, stiffly spreading or reflexed at maturity. Species about four; in the American Tropics, one extending into Florida.

Type species: *Reimaria acuta* Flügge.
Reimarochloa Hitchc., Contr. U. S. Nat. Herb. **12**: 198. 1909. The type is designated. The genus includes most of the species that have been assigned to Reimaria Flügge, the type of which is *R. candida,* a species of Paspalum.

Only one species is found in the United States, *Reimarochloa oligostachya* (Munro) Hitchc. (fig. 136), confined to Florida and Cuba. It has no economic importance.

117. PASPALUM L.

Spikelets plano-convex, usually obtuse, subsessile, solitary or in pairs, in two rows on one side of a narrow or dilated rachis, the back of the fertile lemma toward it; first glume usually wanting; second glume and sterile lemma commonly about equal, the former rarely wanting; fertile lemma usually obtuse, chartaceous-indurate, the margins inrolled.

Mostly perennials, with one to many spikelike racemes, these single or paired at the summit of the culms or racemosely arranged along the main axis. Species numerous, probably as many as 200, widely distributed in the warmer parts of both hemispheres; about 50 species in the United States, mostly in the Southeastern States.

Type species: *Paspalum dimidiatum* L.
Paspalum L., Syst. Nat. ed. 10, **2**: 855, 1759. Four species are described, *P. dimidiatum* (of which "Panicum dissectum sp. pl. 57 n. 6" is cited as a syno-

nym), *P. virgatum*, *P. paniculatum*, and *P. distichum*. The first is selected as the type. All are still retained in the genus.

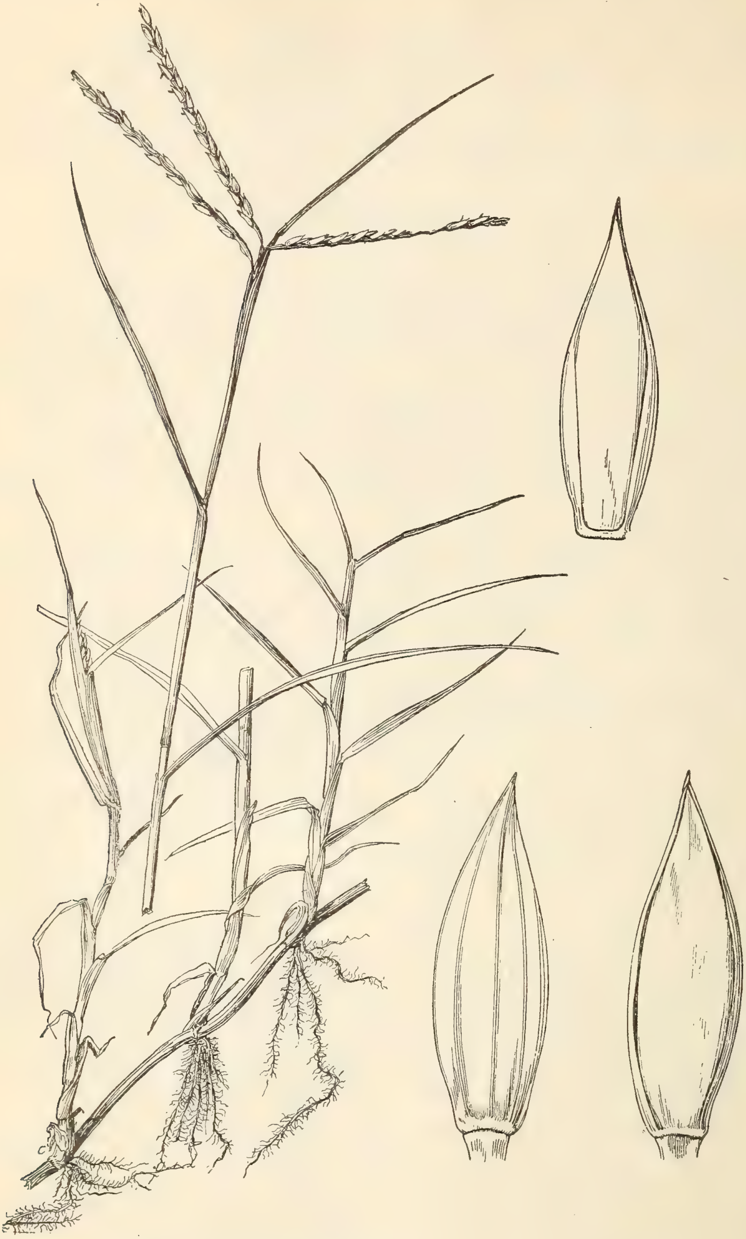

FIG. 136.—*Reimarochloa oligostachya*. Plant × ½; two views of spikelet and fertile floret, × 10.

Ceresia Pers., Syn. Pl. **1**: 85. 1805. A single species, *C. elegans* Pers., is included. This is one of the species having a broad-winged rachis.

Reimaria Flügge, Gram. Monogr. 213. 1810. Three species are included, *R. candida* Humb. and Bonpl., *R. elegans*, and *R. acuta*. The first two are species of Paspalum in which both glumes are wanting, the third, to which the generic description less aptly applies, is a species of Reimarochloa. *Reimaria candida* is taken as the type.

Cymatochloa Schlecht., Bot. Zeit. **12**: 817, 821. 1854. Two names, "*C. fluitans* (*Ceresia fluitans* Ell.)" and "*C. repens* (*Paspalum repens* Berg.)" are given. Both names apply to the same species, *Paspalum repens* Berg.

Dimorphostachys Fourn., Compt. Rend. Acad. Sci. (Paris) **80**: 441. 1875. The type is *Panicum monostachyum* H. B. K., the first of four species mentioned.

Paspalum is closely allied to Panicum, differing chiefly in the strictly racemose inflorescence and the plano-convex spikelets in which the first glume is wanting. In a few species (section Dimorphostachys, in *Paspalum distichum* and in *P. bifidum* (Bertol.) Nash) the first glume is present on at least a part of the spikelets. In *P. pulchellum* Kunth of tropical America and a few other species both glumes are wanting.

In spite of the large number of species in this genus, very few are of economic importance. Most of the species make a sparse growth in moist pine barrens and old fields and are not grazed to any extent. A few species inhabiting meadows and savannas furnish a limited amount of forage. Among these may be mentioned *P. laeve* Michx. (fig. 137) and *P. ciliatifolium* Michx., and the allies of these species. *Paspalum laeve*, with 2 or 3 racemes and spikelets 2.5 mm. long, is common from Maryland to Florida and Texas. *Paspalum ciliatifolium* and its allies, besides the one to few slender racemes on the main culm, have several naked branches from the upper sheaths, each branch usually bearing a single raceme.

Paspalum distichum L., with creeping stolons and racemes in pairs at the summit of the culms, is widely distributed along muddy coasts and ditch banks from Virginia to Florida and thence across the continent to California and Washington. Where abundant it furnishes some forage.

Paspalum dilatatum Poir. has been tried as a forage grass in the Southern States, where it has been cultivated under the name of water grass. It has little to recommend it here, but in the Hawaiian Islands it gives much promise as a pasture grass. In tropical America species of Paspalum form an important element in the grazing land of the savannas, *P. notatum* Flügge being one of the most abundant.

118. PANICUM L.

Spikelets more or less compressed dorsiventrally, arranged in open or compact panicles, rarely racemes; glumes 2, herbaceous, nerved, usually very unequal, the first often minute, the second typically equaling the sterile lemma, the latter of the same texture and simulating a third glume, bearing in its axil a membranaceous or hyaline palea and sometimes a staminate flower, the palea rarely wanting;

fertile lemma chartaceous-indurate, typically obtuse, the nerves obsolete, the margins inrolled over an inclosed palea of the same texture, a lunate line of thinner texture at the back just above the base, the rootlet protruding through this at germination.

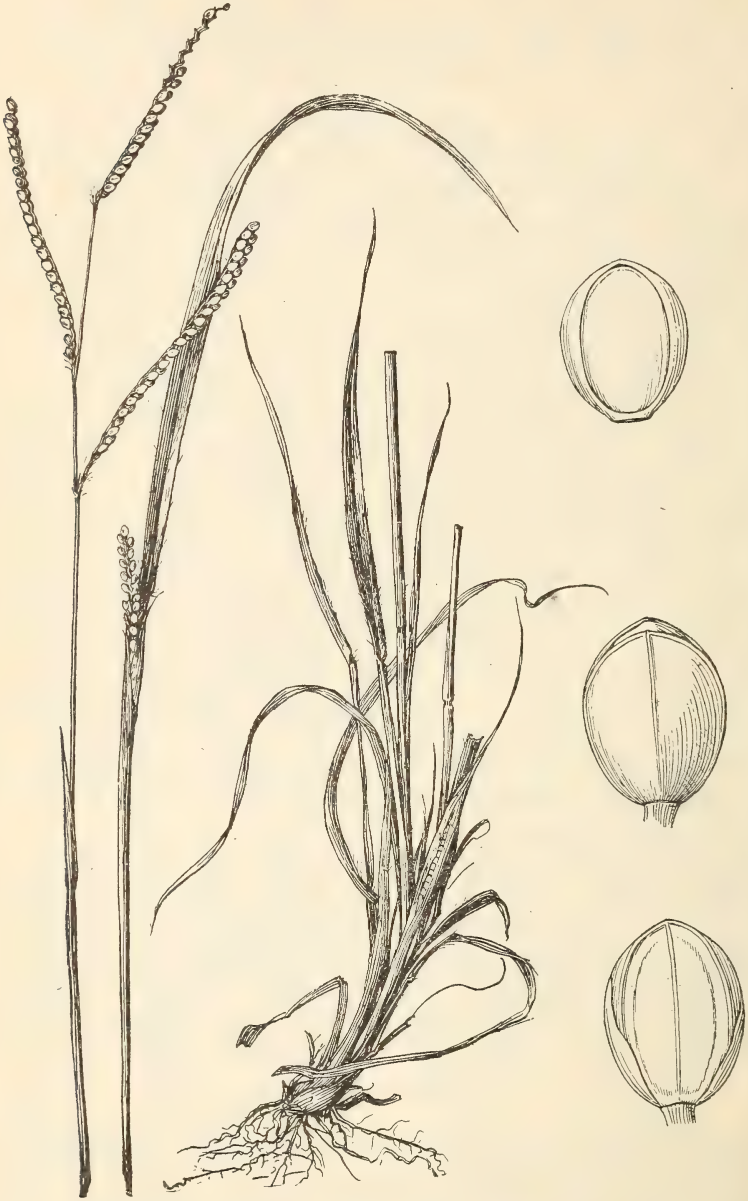

FIG. 137.—*Paspalum laeve.* Plant, × ½; two views of spikelet and fertile floret, × 10.

Annual or perennial grasses, of various habit. Species probably about 500, mostly confined to the warmer regions of both hemispheres, about 150 species being found in the United States.

Type species: *Panicum miliaceum* L.

Panicum L., Sp. Pl. 55, 1753; Gen. Pl., ed. 5, 29. 1754. Twenty species are described. The first ten and the fifteenth are now referred to other genera. Of the species considered typical by Linnæus, as indicated by the description in his Genera Plantarum, *Panicum miliaceum* is the only one cultivated and is therefore chosen as the type.[1]

Eatonia Raf., Journ. de Phys. 89: 104. 1819. A single species, *E. purpurascens*, which is the same as *Panicum virgatum*, is included.

Steinchisma Raf., Bull. Bot. Seringe 1: 220. 1830. "*Panicum divaricatum, P. hians*" are cited, both names applying to the same species, *P. hians* Ell.

Phanopyrum (Raf.) Nash, in Small, Fl. Southeast. U. S. 104. 1903. Based on "Panicum, subgenus Phanopyrum Raf.," with a single species, *P. gymnocarpon* (Ell.) Nash.

Chasea Nieuwl., Amer. Midl. Nat. 2: 64. 1911. A new name proposed for "Panicum of the authors not of Linnæus or only in part," the name Panicum being applied to Chaetochloa.

Among the species of the United States two subgenera are recognized, besides Panicum proper.

Subgenus Paurochaetium Hitchc. and Chase. Perennials with tufted culms, erect narrow blades, narrow, more or less spikelike inflorescence, the ultimate branchlets produced beyond the uppermost spikelets as a bristle 1 to 6 mm. long, the apiculate fruits transversely rugose. There are four species within our limits, one from Florida, three from Texas. This subgenus shows a transition to Chaetochloa.

Subgenus Dichanthelium Hitchc. and Chase. Perennials forming a usually well-marked rosette of winter leaves, having a vernal phase of simple culms and terminal panicles of small, perfect, but usually sterile spikelets, and an autumnal phase produced by the branching of the culms after the maturity of the primary panicles, the secondary leaves and panicles usually much reduced, the spikelets cleistogamous and fruitful, sometimes hidden in the sheaths. There are 105 species within our limits, the species being especially abundant on the Atlantic Coastal Plain. A representative of this subgenus is *Panicum dichotomum* L. (fig. 138). A common species in the Eastern States is *P. clandestinum* L. (Pl. XVII), one of the most robust representatives of the group. This has bristly sheaths and cordate clasping blades as much as an inch wide. It grows in moist soil and furnishes a moderate amount of forage.

The remaining species belong for the most part to true Panicum, called by some the subgenus Eupanicum. The more important of these are the following: *Panicum barbinode* Trin., Para grass, a perennial with stout stolons as much as 15 feet long, culms 3 to 6 feet tall from a creeping base, bearded nodes, and panicles 4 to 6 inches long, consisting of several spikelike racemes of glabrous spikelets

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[1] For a full discussion of the type species of Panicum, see Hitchcock and Chase, Contr. U. S. Nat. Herb. 15: 13. 1910.

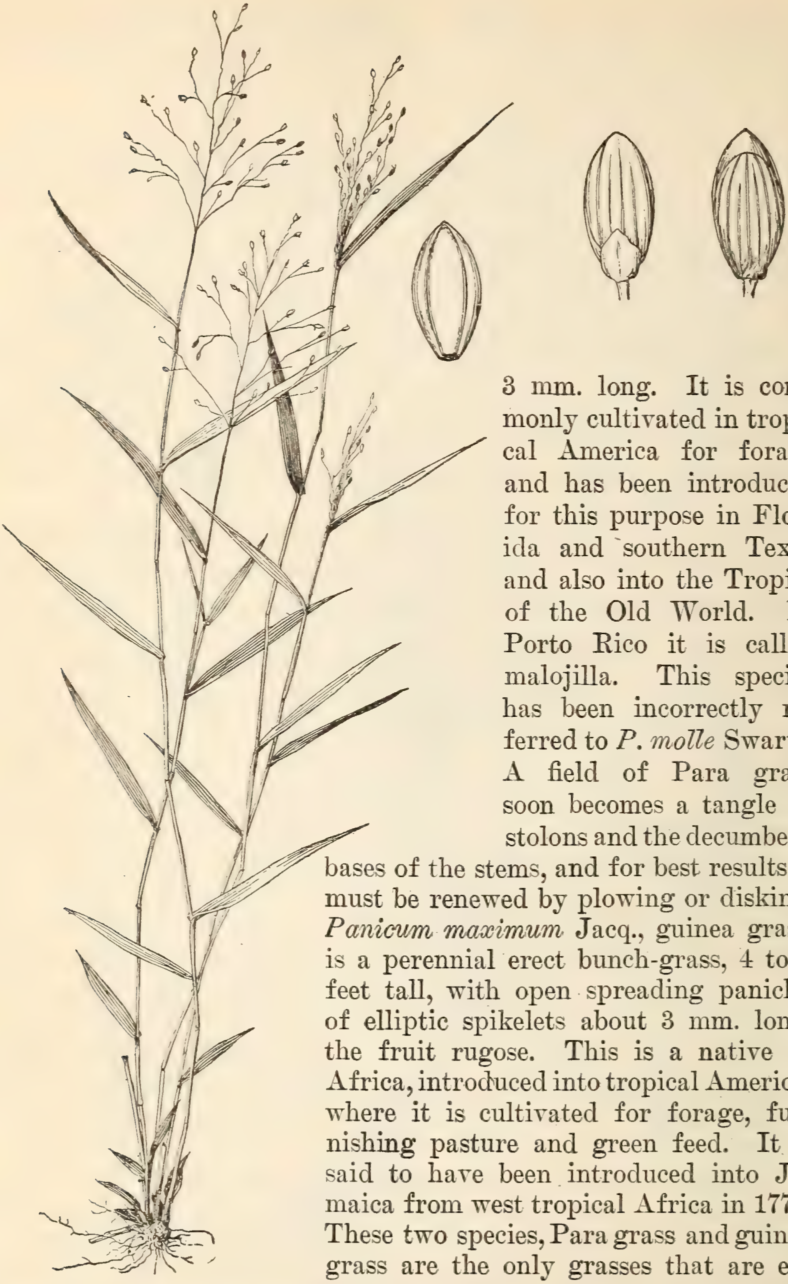
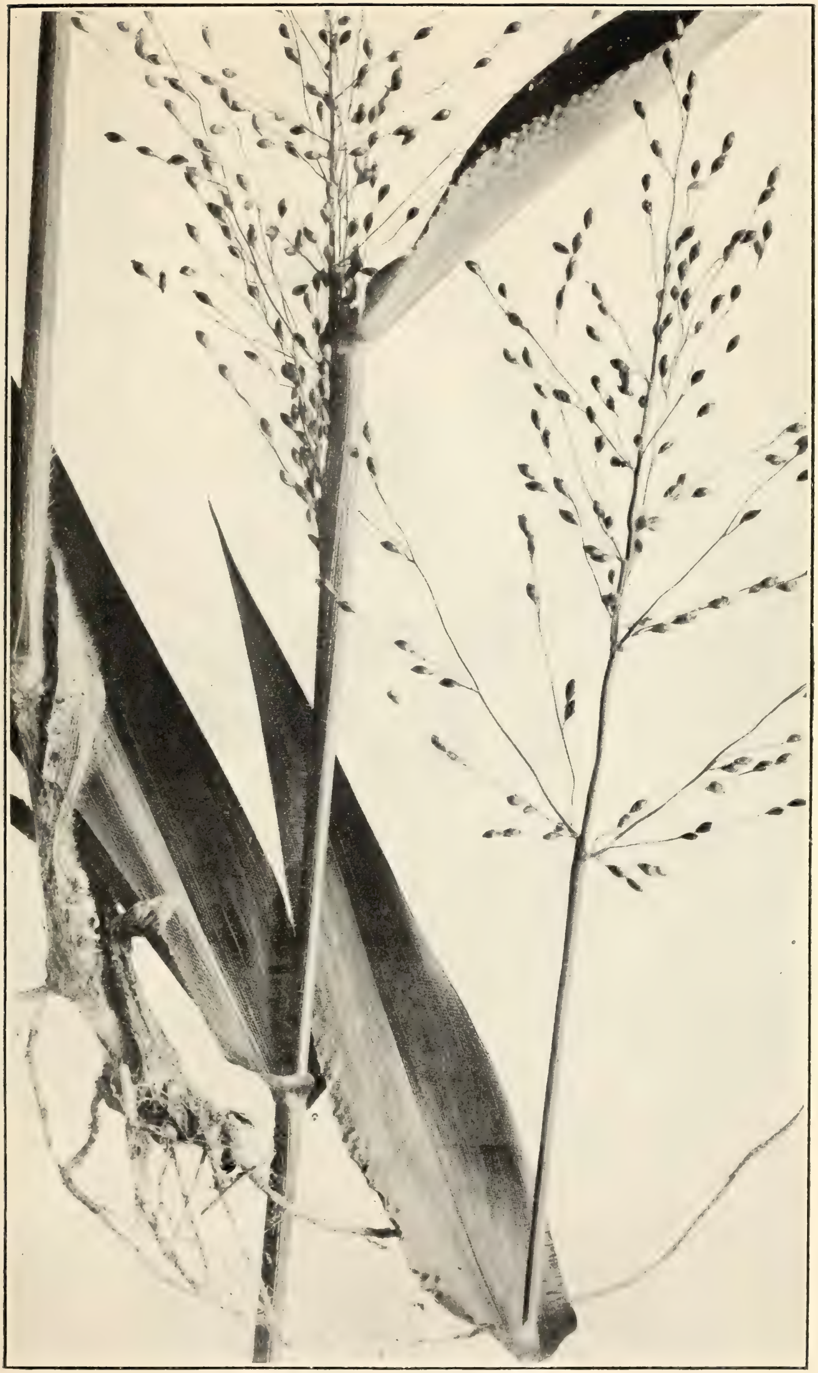


FIG. 138.—*Panicum dichotomum.* Plant, × ½; two views of spikelet and fertile floret, × 10.

3 mm. long. It is commonly cultivated in tropical America for forage and has been introduced for this purpose in Florida and southern Texas and also into the Tropics of the Old World. In Porto Rico it is called malojilla. This species has been incorrectly referred to *P. molle* Swartz. A field of Para grass soon becomes a tangle of stolons and the decumbent bases of the stems, and for best results it must be renewed by plowing or disking. *Panicum maximum* Jacq., guinea grass, is a perennial erect bunch-grass, 4 to 6 feet tall, with open spreading panicles of elliptic spikelets about 3 mm. long, the fruit rugose. This is a native of Africa, introduced into tropical America, where it is cultivated for forage, furnishing pasture and green feed. It is said to have been introduced into Jamaica from west tropical Africa in 1774. These two species, Para grass and guinea grass are the only grasses that are extensively cultivated for forage in tropical America. *Panicum miliaceum* L., proso millet, broom-corn millet, hog millet, an erect annual 2 to 3 feet tall, with a drooping panicle, is cultivated in Europe for the seed, which is used for food. It is sparingly cultivated in this country for forage.



PANICUM CLANDESTINUM.

Common in moist woods. Useful for forage and for ornament.

EULALIA (MISCANTHUS SINENSIS). GROWN FOR ORNAMENT

Panicum virgatum L. (fig. 139) switch-grass, an erect perennial 3 to 5 feet tall, with open spreading panicle, is common in the eastern half of the United States. It is a constituent of prairie hay. *Panicum bulbosum* H. B. K., of the Southwest develops well-marked corms

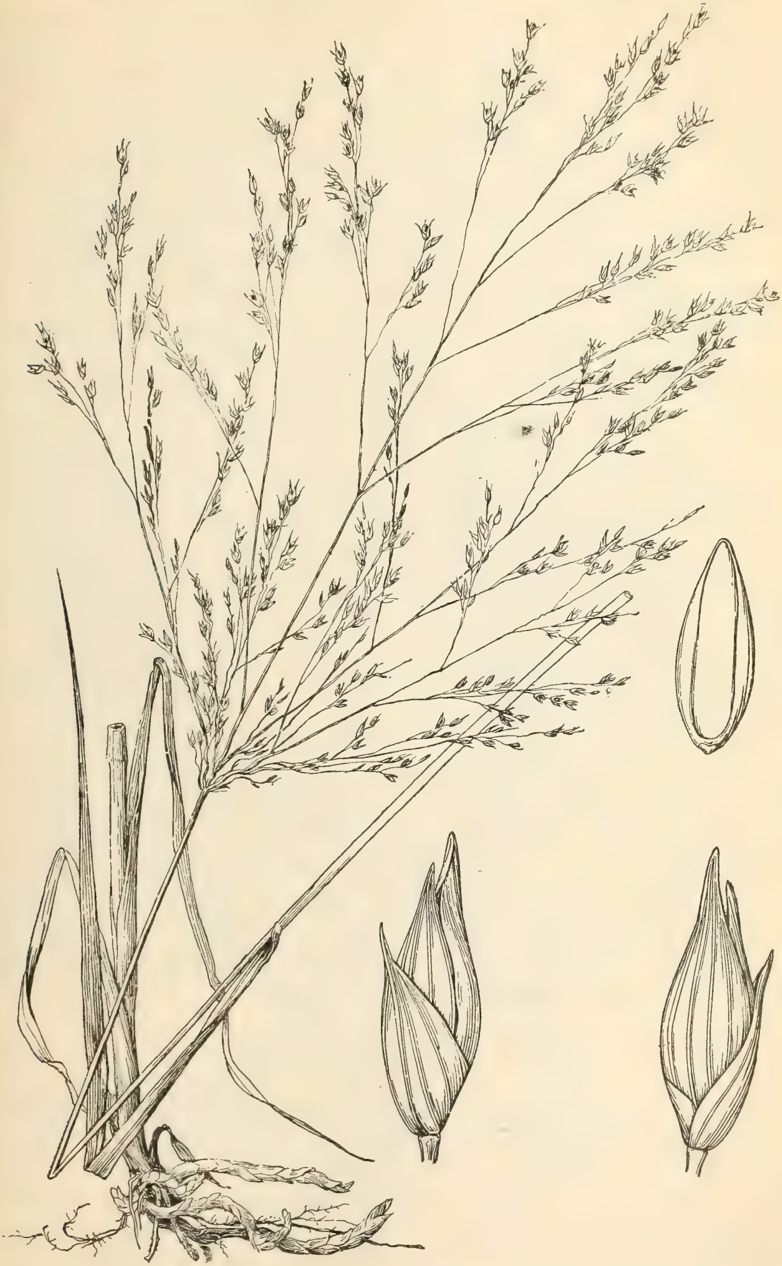


FIG. 139.—Switch-grass, *Panicum virgatum*. Plant, × ½; two views of spikelet and fertile floret, × 10.

at the base of the culms. *Panicum texanum* Buckl., Texas millet, Colorado grass, is an annual rather weedy grass of Texas that has been utilized for hay. It has been called Colorado grass because it grows in the valley of the Colorado River. *Panicum dichotomiflorum* Michx. is a smooth, annual, much-branched, rather succulent weed, common in the eastern United States in the autumn. The first glume is very short and truncate. *Panicum capillare* L. (fig. 140), old-witch grass, is an annual weed, with hirsute sheaths and a relatively large open capillary panicle with small spikelets. At maturity the panicle breaks away and is blown about by the wind as a tumble grass. *Panicum geminatum* Forsk. (fig. 141), a common tropical species, extends into Florida and Texas.

Besides the two subgenera there are a few species that can not be included in true Panicum. Two of these within our range are of some importance. *Panicum obtusum* H. B. K. (fig. 142), a forage grass of the Southwest, producing long wiry stolons with bearded, swollen nodes, and short, erect, fertile culms with narrow panicles of obtuse spikelets, is called grapevine mesquite, because of the long, tough stolons, and adobe grass, because it is found on slightly alkaline soil. This species differs from Eupanicum in the long first glume and the racemose branches of the inflorescence. *Panicum hemitomon* Schult., maiden cane, is found in moist soil, often in the water, from Texas to Florida and Delaware near the coast. It produces extensively creeping rhizomes and numerous sterile shoots. The panicle is narrow, with short appressed branches. On account of the rhizomes it becomes a troublesome weed in cultivated soil, especially in Florida. This species differs from Eupanicum in the less chartaceous fruit with the palea free at the tip. The seeds of *Panicum sonorum* Beal are used for food by the Cocopa Indians.

See Williams, U. S. Dept. Agr., Farmers' Bull. 101, 1899; Scribner, U. S. Dept. Agr., Div. Agrost. Bull. 20, fig. 23, 1900; Hitchcock and Chase, Contr. U. S. Nat. Herb. 15, 1910. The last work is a revision of the genus Panicum in North America and gives full descriptions and synonymy of all the species.

119. Lasiacis (Griseb.) Hitchc.

Spikelets subglobose, placed obliquely on their pedicels; first glume broad, somewhat inflated-ventricose, usually not over one-third the length of the spikelet, several-nerved; second glume and sterile lemma about equal, broad, abruptly apiculate, papery-chartaceous, shining, many-nerved, glabrous, or lanose at the apex only, the lemma inclosing a membranaceous palea and sometimes a staminate flower; fertile lemma white, bony-indurate, obovoid, obtuse, this and the palea of the same texture, bearing at the apex in a slight crateriform

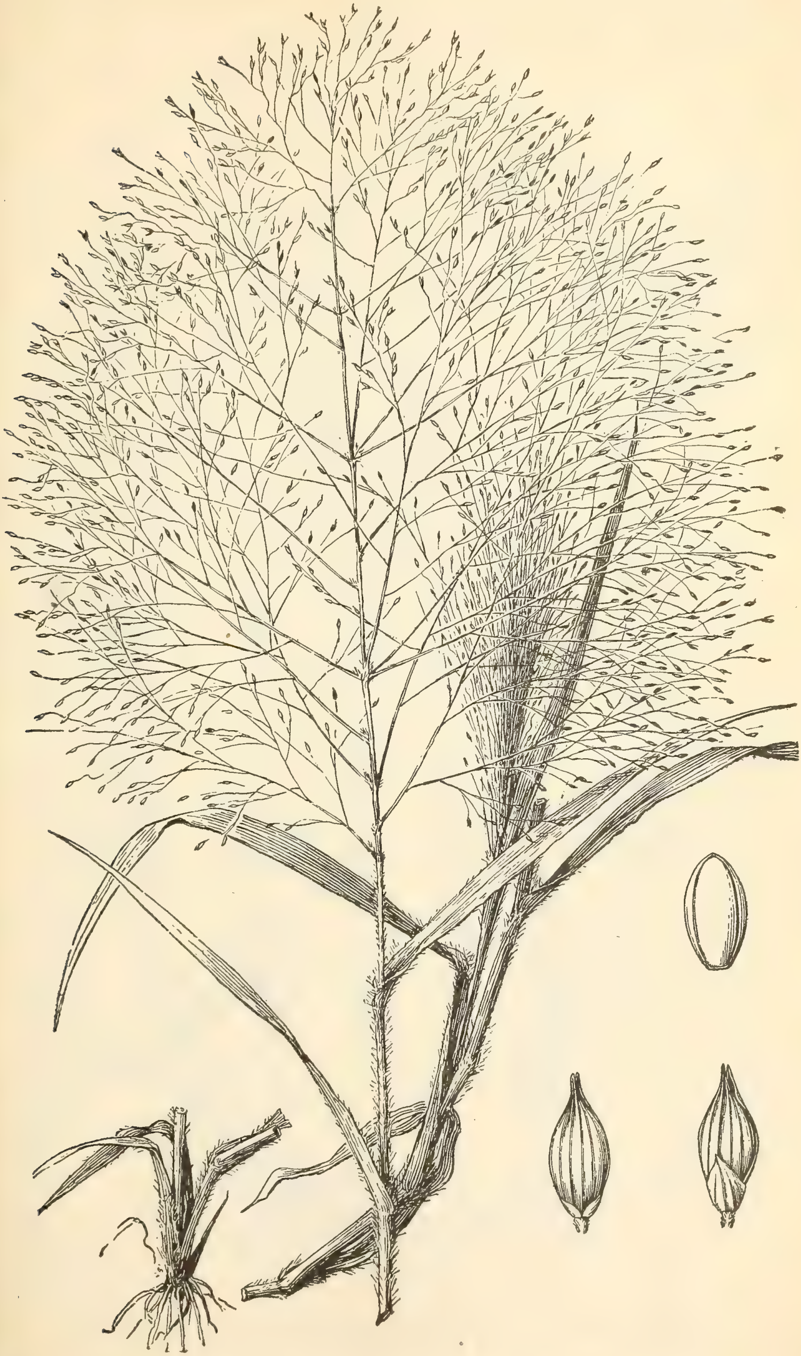


FIG. 140.—Old-witch grass, *Panicum capillare*. Plant, × ½; two views of spikelet and fertile floret, × 10.

depression a tuft of woolly hairs, the palea concave below, gibbous above, the apex often free at maturity.

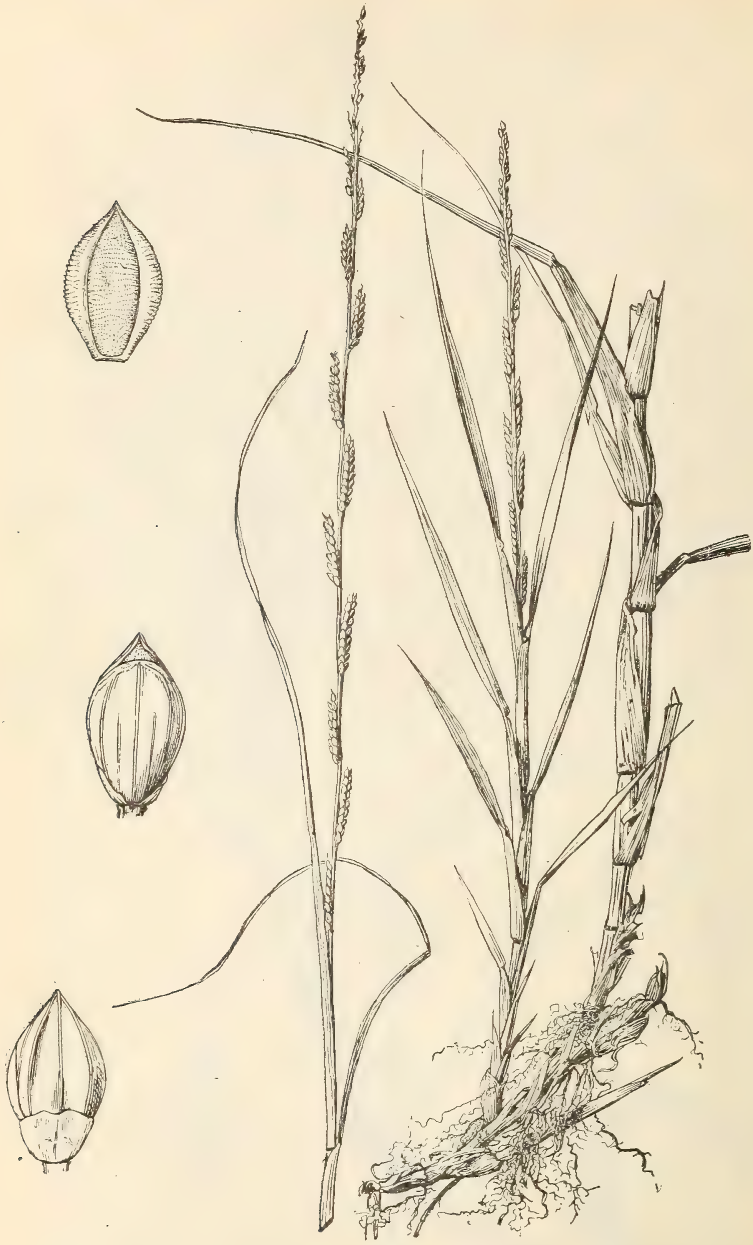


Fig. 141.—*Panicum geminatum.* Plant, × ½; two views of spikelet and fertile floret × 10.

Large branching perennials, with woody culms often clambering several feet high into shrubs or trees, the blades firm, flat, usually lanceolate and narrowed into a petiole, the spikelets in an open panicle. Species about 20; in the American Tropics, one extending into southern Florida.

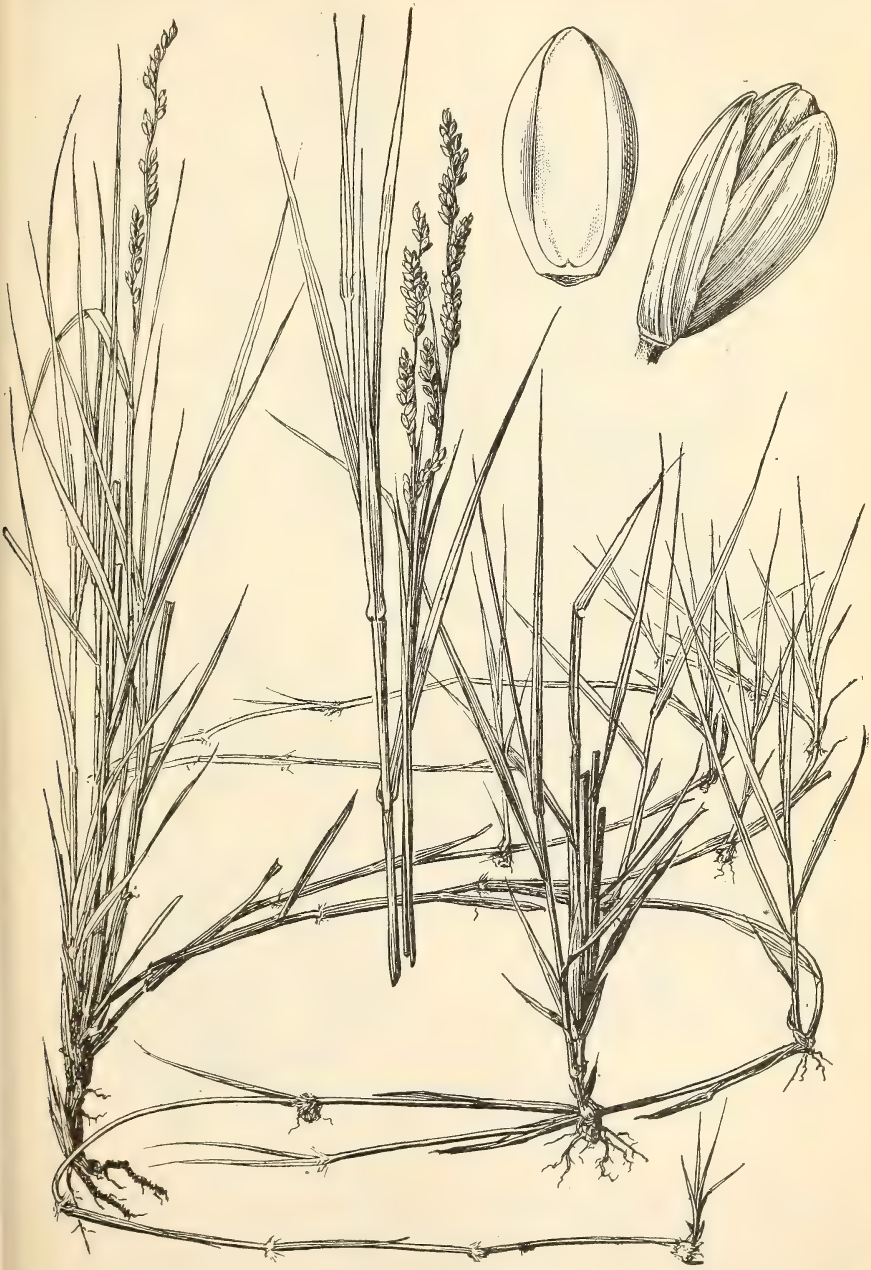


FIG. 142.—Grapevine mesquite, *Panicum obtusum*. Plant, × ½; spikelet and fertile floret, × 10.

Type species: *Panicum divaricatum* L.

Panicum, section Lasiacis Griseb, Fl. Brit. W. Ind. 551. 1864. Five species included, the first of which is *P. divaricatum.*

Lasiacis Hitchc., Contr. U. S. Nat. Herb. **15**: 16. 1910. The type is designated. This genus was previously included as a section in Panicum, from which it differs in habit, the woody culms resembling those of bamboos, and in the oblique spikelets with the woolly apex of the fruit and the gibbous fertile palea.

The only species in the United States is *Lasiacis divaricata* (L.) Hitchc. (fig. 143) of southern Florida. It has no economic value.

120. SACCIOLEPIS Nash.

Spikelets oblong-conic; first glume small, much shorter than the spikelet; second glume broad, inflated-saccate, strongly many-nerved; sterile lemma narrower, flat, fewer nerved, its palea nearly as long, often subtending a staminate flower; fertile lemma stipitate, elliptic, chartaceous-indurate, the margins inrolled, the palea not inclosed at the summit.

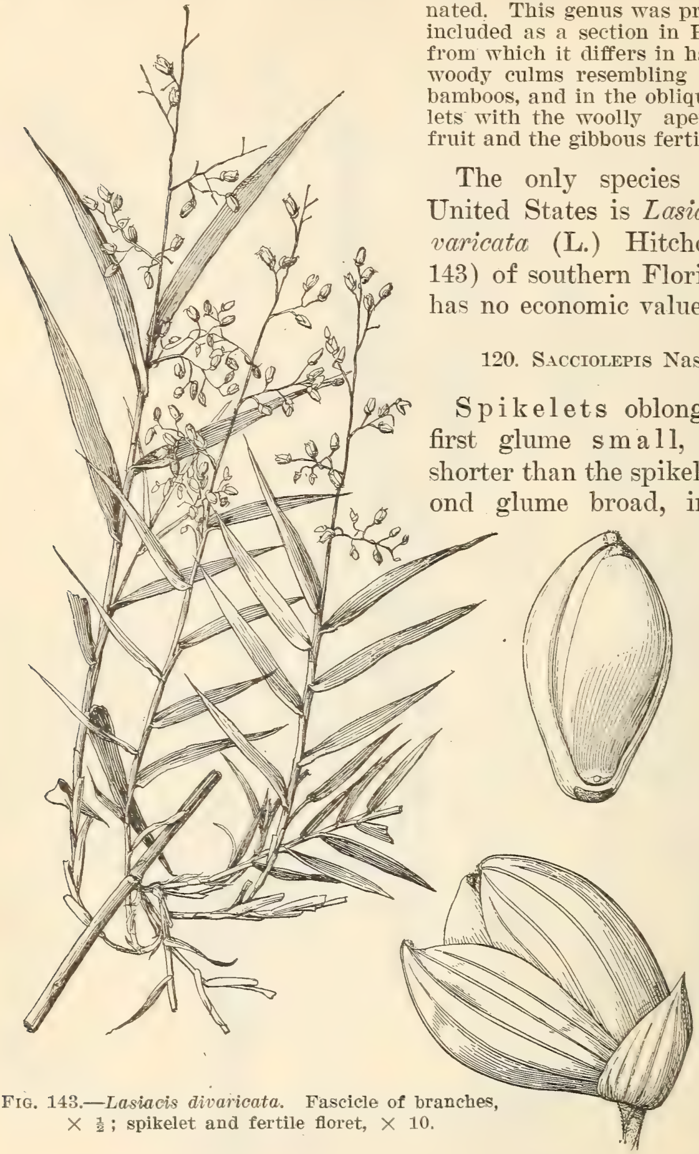


FIG. 143.—*Lasiacis divaricata.* Fascicle of branches, × ½; spikelet and fertile floret, × 10.

Annuals or perennials, of wet soil, usually branching, the inflorescence a dense, usually elongate, spikelike panicle. Species about 12; in the Tropics of both hemispheres, 1 extending into the southeastern United States.

Type species: *Panicum gibbum* Ell.
Sacciolepis Nash, in Britton, Man. 80. 1901. Only one species is described.

Sacciolepis striata (L.) Nash (*Holcus striatus* L., *Panicum gibbum* Ell.) (fig. 144) is a stoloniferous marsh grass found from Virginia to Oklahoma and southward. It has no economic value.

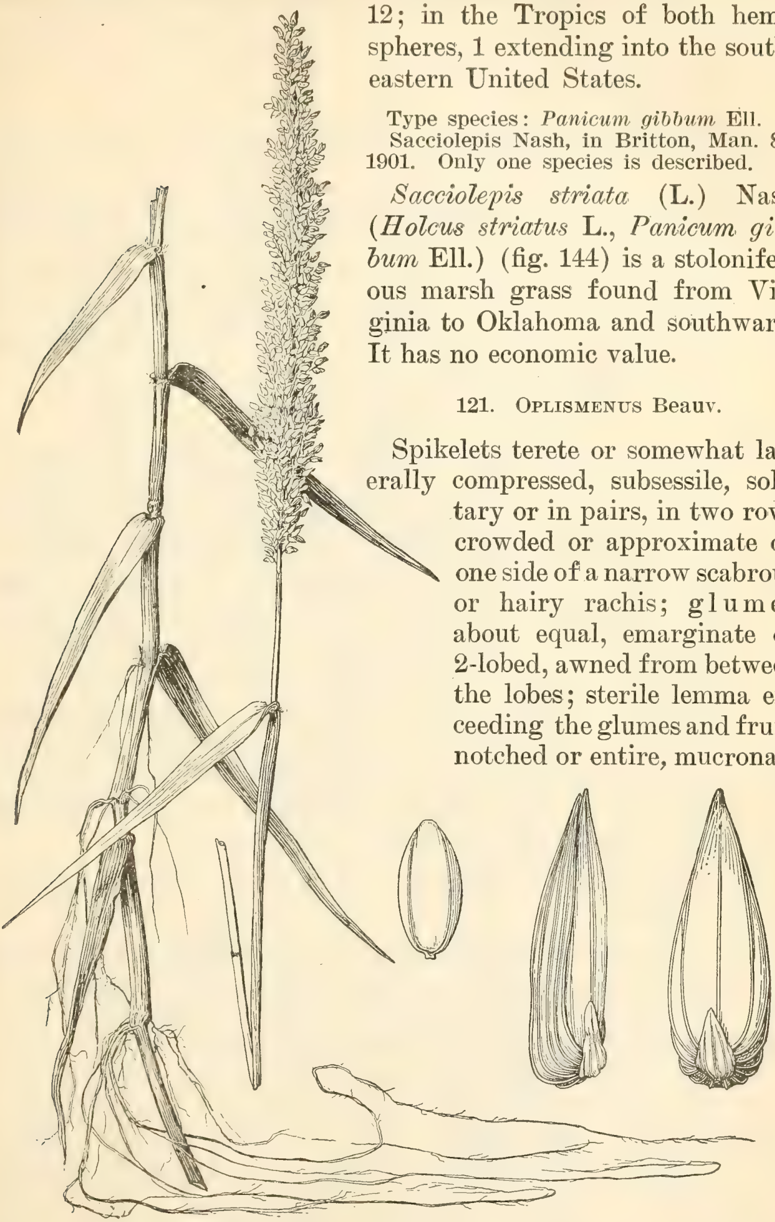


FIG. 144.—*Sacciolepis striata.* Plant, × ½; two views of spikelet and fertile floret, × 10.

121. OPLISMENUS Beauv.

Spikelets terete or somewhat laterally compressed, subsessile, solitary or in pairs, in two rows crowded or approximate on one side of a narrow scabrous or hairy rachis; glumes about equal, emarginate or 2-lobed, awned from between the lobes; sterile lemma exceeding the glumes and fruit, notched or entire, mucronate or short-awned, inclosing a hyaline palea; fertile lemma elliptic, acute, convex or boat shaped, the firm margins clasping the palea, not inrolled.

Freely branching, creeping, shade-loving annuals or perennials, with erect flowering shoots, flat, thin lanceolate or ovate blades, and several one-sided, thickish, short spikes rather distant on a main axis. Species about 10, in the Tropics of both hemispheres, 1 extending into the Southern States.

Type species: *Oplismenus africanus* Beauv.

Oplismenus Beauv., Fl. Owar. **2**: 14, pl. 58, f. 1. 1809. A single species is described.

Orthopogon R. Br., Prodr. Nov. Holl. 194. 1810. Four species are described, *O. compositus, O. aemulus, O. flaccidus,* and *O. imbecillis. Panicum compositum* L. is chosen as the type, this being the basis of the first species of Orthopogon.

The only species in the United States is *Oplismenus setarius* (Lam.) Roem. and Schult. (fig. 145), found in shady places from Florida to Texas. This is grazed by stock, but is not sufficiently abundant to be of importance.

122. ECHINOCHLOA Beauv.

Spikelets plano-convex, often stiffly hispid, subsessile, solitary or in irregular clusters on one side of the panicle branches; first glume about half the length of the spikelet, pointed; second glume and sterile lemma equal, pointed, mucronate, or the glume short-awned and the lemma long-awned, sometimes conspicuously so, inclosing a membranaceous palea and sometimes a staminate flower; fertile lemma plano-convex, smooth and shining, acuminate-pointed, the margins inrolled below, flat above, the apex of the palea not inclosed.

Coarse, often succulent, annual, or sometimes perennial, grasses, with compressed sheaths, linear flat blades, and rather compact panicles composed of short, densely flowered racemes along a main axis. Species about 10, in the warm and temperate regions of both hemispheres; 4 species in the United States.

Type species: *Panicum crusgalli* L.

Echinochloa Beauv., Ess. Agrost. 53, pl. 11, f. 2. 1812. The species figured is selected as the type.

With the exception of *Echinochloa colonum* (L.) Link, the species of Echinochloa have distinctly awned or awn-pointed spikelets. In that cosmopolitan species the spikelets are merely apiculate or mucronate, and the racemes are simple and rather remote.

Echinochloa crusgalli (L.) Beauv. (fig. 146), barnyard grass, is a common weedy annual found throughout the country except at higher altitudes. The panicles vary much in the size and length of the awns, and in color vary from green to dark purple. In fields and waste places the plants are usually spreading, but in water or wet places may be stout and erect. An erect short-awned form, with short, ascending racemes, found in the Southwestern States, is the Mexican *E. crusgalli zelayensis* (H. B. K.) Hitchc. (*Oplismenus zelayensis* H. B. K.). *E. crusgalli edulis* (*Panicum frumentaceum* Roxb., 1820, not Salisb., 1796) is a form that has been cultivated in tropical Asia for the seeds, which are used for food. It differs in having short, compact, appressed, somewhat incurved racemes and nearly awnless spikelets. This form has been advertised by seedsmen in this country as billion-dollar grass and recommended for forage. It has some forage value, but requires considerable moisture to produce abundantly, and is rather too succulent to make good hay.

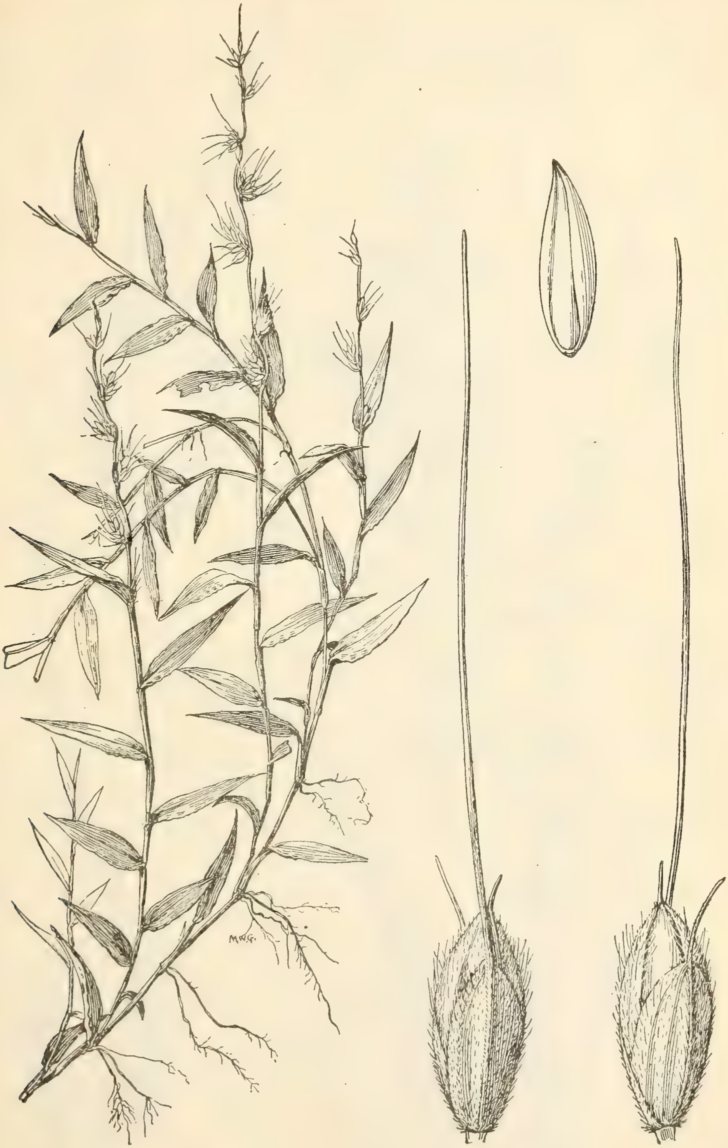


Fig. 145.—*Oplismenus setarius.* Plant, × ½; two views of spikelet and fertile floret, × 10.

In these forms the sheaths are smooth. *Echinochloa walteri* (Pursh) Heller is a closely allied native species with hirsute sheaths and long-awned spikelets.

All the species of Echinochloa are grazed by horses and cattle, but usually grow in situations where they can not well be utilized.

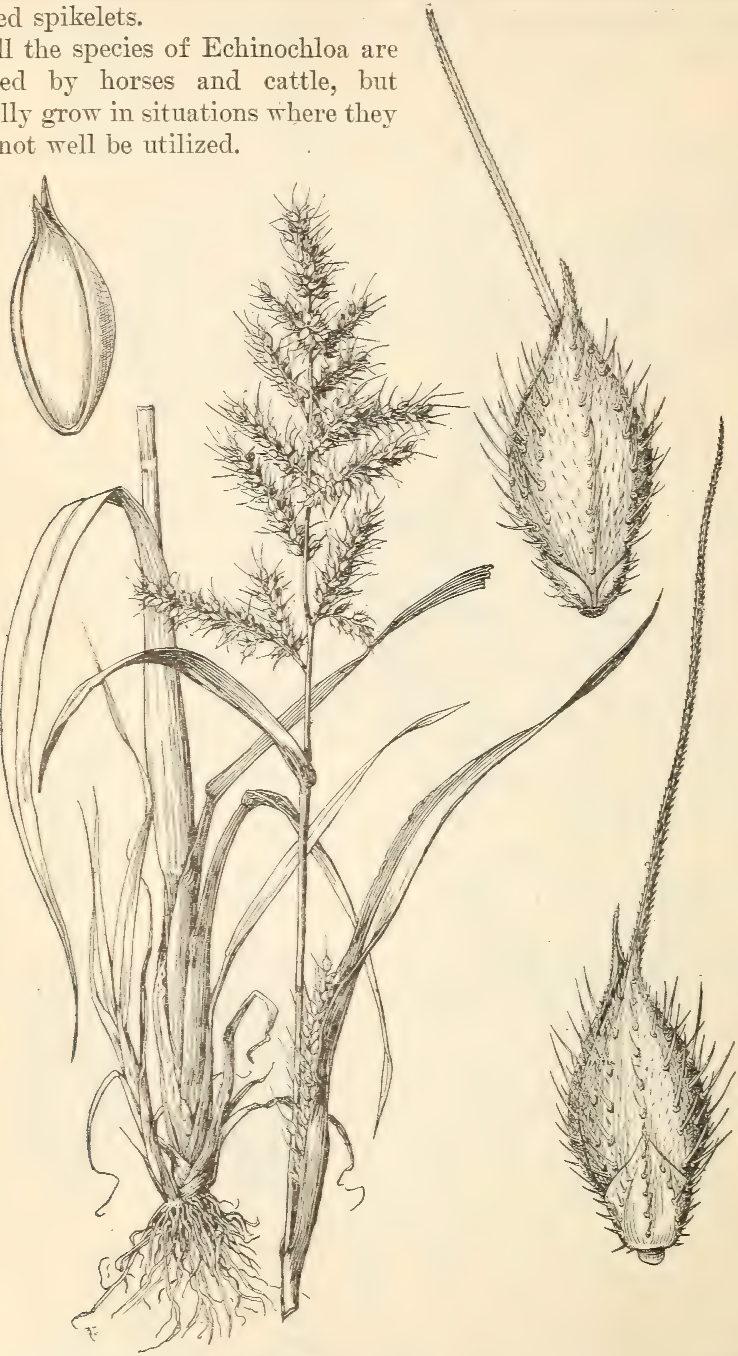


FIG. 146.—Barnyard grass, *Echinochloa crusgalli.* Plant, × ½; two views of spikelet and fertile floret, × 10.

123. TRICHOLAENA Schrad.

Spikelets on short capillary pedicels; first glume small, much shorter than the spikelet, villous; second glume and sterile lemma equal, raised on a stipe above the first glume, emarginate or slightly lobed, short-awned, covered, except toward the apex, with long silky hairs, the palea of the sterile lemma well developed; fertile lemma shorter than the spikelet, cartilaginous, smooth, boat shaped, obtuse, the margins thin, not inrolled, inclosing the margins of the palea.

Perennial or annual grasses, with rather open panicles of silky spikelets. Species about 15, in the Eastern Hemisphere, mostly in Africa, one cultivated in the United States.

Type species: *Tricholaena micrantha* Schrad.

Tricholaena Schrad.; Schult., Mant. **2**: 163. 1824. Three species are described, but the second and third are included in the genus with a question. The first species is taken as the type.

Tricholaena rosea Nees (fig. 147), Natal grass, is becoming an important forage grass in the sandy lands of Florida, where it has been recently introduced. It is an upright, rather slender perennial, 2 to 4 feet tall, with beautiful purple panicles, 4 to 10 inches long. The color varies from light purple or pink to wine color. Although a perennial, it is usually cultivated as an annual, as it will not survive temperatures below freezing.

124. CHAETOCHLOA Scribn.
(*Setaria* Beauv.)

Spikelets subtended by one to several bristles (sterile branchlets), falling free from the bristles, awnless; first glume broad, usually less than half the length of the spikelet, 3 to 5 nerved; second glume and sterile lemma equal, or the former shorter, several-nerved; fertile lemma coriaceous indurate, smooth or rugose.

Annual or perennial grasses, with narrow terminal panicles, these dense and spikelike or somewhat loose and open. Species about 65, in the tropical and warm temperate regions of both hemispheres; 18 species in the United States.

Type species: *Panicum viride* L.

Setaria Beauv., Ess. Agrost. 51, pl. 13, f. 3, 1812, not Acharius, 1789, nor Michaux, 1803. Fourteen species are listed, *S. viridis* being illustrated. *Panicum viride* L., on which this species is based, is taken as the type.

Chaetochloa Scribn., U. S. Dept. Agr., Div. Agrost. Bull. **4**: 38. 1897. Scribner proposes the name Chaetochloa for Setaria Beauv., stating that the name Setaria was first used by Beauvois (Fl. Owar. 1809)[1] for a species of Pennisetum. Scribner himself applies the name Chaetochloa to the species allied to *Panicum viride*. Hence it seems that he wished to substitute Chaetochloa for Setaria as used by Beauvois in his Essai (Ess. Agrost. 51, pl. 13, f. 3, 1812). The figured species, *Setaria viridis* (L.) Beauv., becomes the type.

The name Ixophorus Schlecht. was applied to this genus by Nash,[2] but that is based on a Mexican species not congeneric with ours.

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[1] According to Dr. J. H. Barnhart the part containing Setaria (Fl. Owar. **2**: 80) was not published until 1818.

[2] Britton and Brown, Illustr. Fl. **1**: 125. 1896.

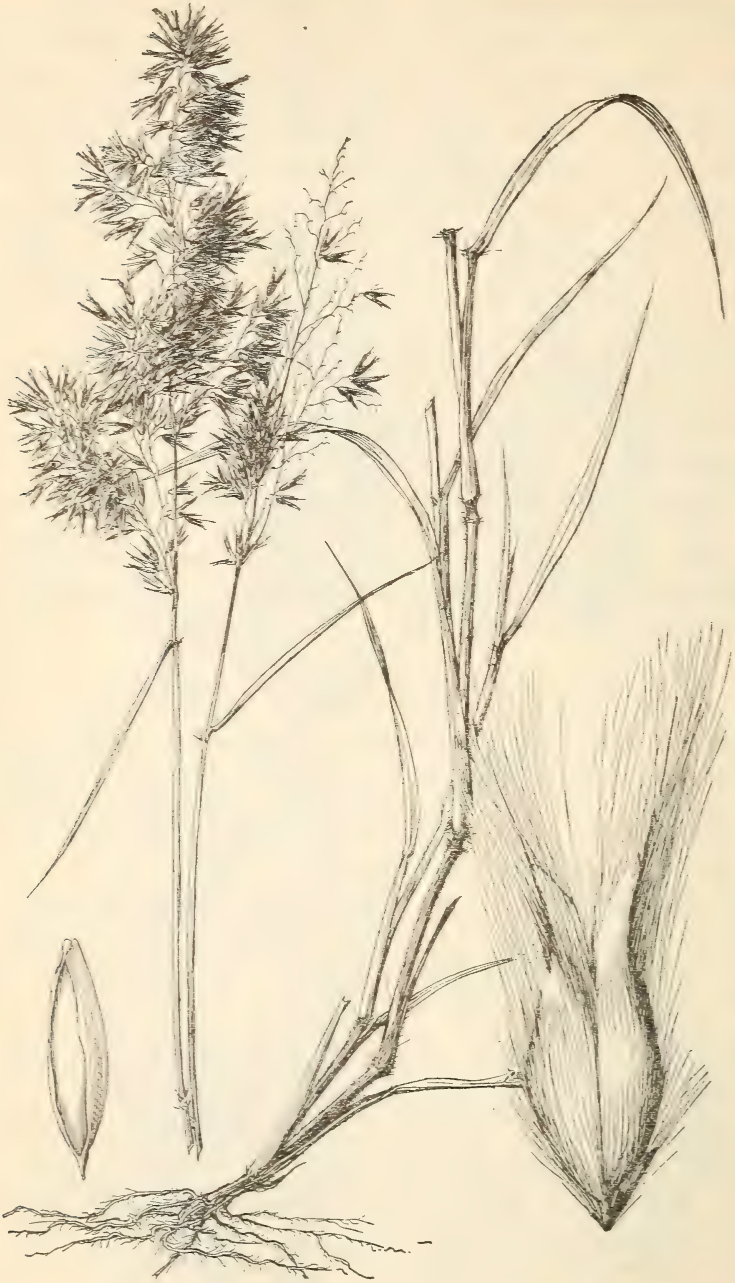

FIG. 147.—Natal grass, *Tricholaena rosea*. Plant, × ½; spikelet and fertile floret, × 10.

Beal[1] applied the name Chamaeraphis R. Br. to American species of Chaetochloa, but that is an Australian genus in which the articulation is below the spikelet-bearing branches, as in Pennisetum.

One group of this genus, section Ptychophyllum, has broad, often plaited, blades and loose or open panicles, the bristles solitary and at the base of only the uppermost spikelets on the short branchlets. This section has usually been referred to Panicum, but shows a closer relationship to Chaetochloa. Two species of this group, both perennials, are cultivated in greenhouses or in the open in the Tropics for ornament, chiefly on account of the broad plaited blades that resemble those of young palms. *Chaetochloa sulcata* (Aubl.) Hitchc. (*Panicum sulcatum* Aubl.) has narrow, rather dense panicles, 1 to 2 feet long, and blades about 2 inches wide. *Chaetochloa palmifolium* (Willd.) Hitchc. and Chase has large open panicles and broader blades. This has been known in cultivation as *Panicum plicatum*, but is not *P. plicatum* Lam. It is sometimes called palm-grass.

Of the species of Chaetochloa proper[2] (Setaria Beauv.) several are weeds in cultivated soil. Two annual species are common in the eastern United States, where they are known as foxtail or pigeon grass. *Chaetochloa viridis* (L.) Scribn., green foxtail, has a green, somewhat pointed head, with untwisted blades. *Chaetochloa lutescens* (Weigel) Stuntz (*Setaria glauca* of most authors, not *Panicum glaucum* L.) (fig. 148), yellow foxtail, has cylindric yellow obtuse heads and blades twisted in a half spiral so that toward the end the upper surface is beneath.

Another annual species common in waste places is *Chaetochloa verticillata* (L.) Scribn., in which the bristles are backwardly roughened, the heads thus sticking readily to clothing. *Chaetochloa geniculata* (Lam.) Millsp. and Chase is a perennial species resembling yellow foxtail. This is common in the Southern States and throughout the Tropics. *Chaetochloa magna* (Griseb.) Scribn., a robust annual as much as 9 feet high, with a dense panicle or head as much as a foot long and 2 inches in diameter, is found in marshes from Maryland to the West Indies.

Chaetochloa macrostachya (H. B. K.) Scribn. and Merr. (heretofore commonly confused with the South American *C. composita* (H. B. K.) Scribn.), is of some importance as a range grass from Texas to Arizona. It is a pale perennial, with somewhat pointed spikelike panicles. The two annuals, *C. viridis* and *C. lutescens*, are often sufficiently abundant to furnish considerable forage.

The most important species of the genus is *Chaetochloa italica* (L.) Scribn. (*Setaria italica* Beauv.). This is called millet, or, to distinguish it from other kinds of millet, foxtail millet. Millet is an erect annual, 2 to 4 feet tall, with a dense, bristly, yellow or purple head. There are many varieties in cultivation, differing in the size and lobing of the head, the length and color of the bristles, and the color of the seed. Small forms resemble *C. viridis*, but may be distinguished by the articulation of the seed. In *C. viridis* the seed (fruit, that is, the fertile floret) falls from the pedicel inclosed within the glumes. In *C. italica* the seed readily separates from the glumes by an articulation above the sterile lemma. A ripe head of *C. italica* rubbed between the palms yields free seed. A head of *C. viridis* will yield entire spikelets.

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[1] Grasses N. Amer. 2: 150. 1896.

[2] The genus was revised by Scribner and Merrill, U. S. Dept. Agr., Div. Agrost. Bull. 21. 1900.

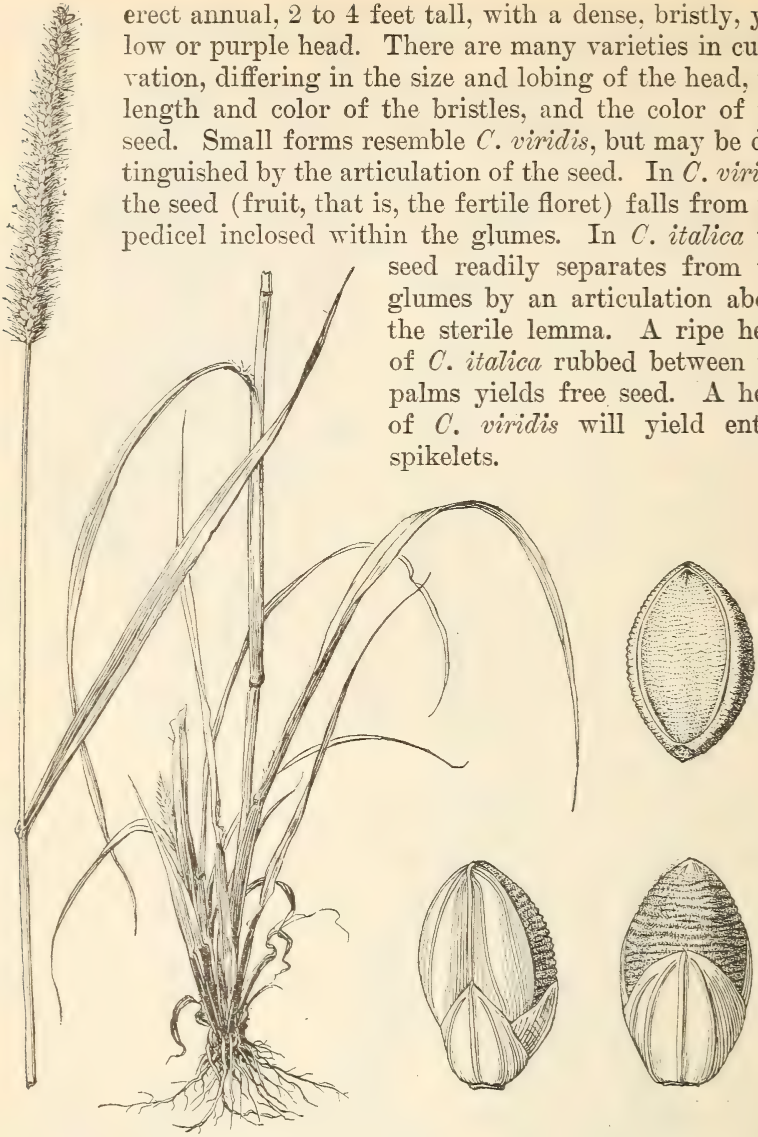

FIG. 148.—Yellow foxtail, *Chaetochloa lutescens*. Plant, × ½; two views of spikelet and fertile floret, × 10.

The varieties of *Chaetochloa italica* cultivated in the United States have been classified as follows[1] (under *Setaria italica*):

Fruit dark colored (reddish or orange to blackish or brownish black).
  Fruit reddish or orange_____________________________________*rubrofructa*.
  Fruit blackish, brownish black, or purplish black with pale yellowish straw lines intermingled, these sometimes predominating_*nigrofructa*.

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[1] See Hubbard, Amer. Journ. Bot. 2: 187. 1915.

Fruit pale (yellowish to straw or light brown).
  Bristles green.
    Panicle more or less open-lobulate ---------- *stramineofructa.*
    Panicle dense or slightly lobulate at base ---------- *germanica.*
  Bristles brown or purple.
    Bristles brown ---------- *brunneoseta.*
    Bristles purple.
      Panicle more or less lobulate ---------- *hostii.*
      Panicle dense or slightly lobulate at base ---------- *metzgeri.*

Subsp. *rubrofructa* Hubb.: The only forms cultivated in the United States are var. *purpureoseta* Hubb., Turkish millet, with purple bristles and a large lobulate head; and subvar. *violacea* (Alef.) Hubb., Kursk millet or Siberian millet, with purple bristles and a smaller dense head.

Subsp. *nigrofructa* Hubb.: The common form cultivated in the United States is var. *atra*, or Hungarian grass. This has small dense heads 1 to 3 inches long with purple bristles.

Subsp. *stramineofructa* Hubb., German millet: Plants robust with heads 4 to 12 inches long and as much as 2 inches wide, the bristles noticeably longer than the spikelets. Forma *breviseta* (Doell) Hubb., Golden Wonder millet, differs in having bristles shorter than the spikelets or barely exceeding them.

Subsp. *germanica* (Mill.) Hubb., common millet: Heads mostly 2 to 3 inches long, one-fourth to one-half an inch thick, the bristles noticeably longer than the spikelets; forma *mitis* (Alef.) Hubb. with bristles shorter than the spikelets or barely exceeding them. There has been an unfortunate misapplication of the name German millet. The forms cultivated under this name are not the subspecies *germanica* as one would suppose (see the preceding subspecies).

Var. *brunneoseta* Hubb., Aino millet: Head large, lobulate, brown. Subvar. *densior* Hubb. has a compact scarcely lobulate head.

Var. *hostii* Hubb., German millet: Head large, lobulate, purple; differs from the other form of German millet (subsp. *stramineofructa*) in having purple bristles.

Var. *metzgeri* (Körnicke) Hubb., common millet: Bristles noticeably longer than the spikelets; differs from the other form of common millet (subsp. *germanica*) in having purple bristles; sometimes called Hungarian grass, a name which should be applied to subsp. *nigrofructa*.

125. PENNISETUM Rich.

Spikelets solitary or in groups of two or three, surrounded by an involucre of bristles, these not united except at the very base, often plumose, falling attached to the spikelets; first glume shorter than the spikelet, sometimes minute or wanting; second glume shorter than or equaling the sterile lemma; fertile lemma chartaceous, smooth, the margin thin, inclosing the palea.

Annual or perennial, often branched grasses, with usually flat blades and dense spikelike panicles. Species about 50, in the tropical regions of both hemispheres; 1 species in southern Florida.

Type species: *Pennisetum typhoideum* Rich.

Pennisetum Rich., in Pers. Syn. Pl. 1: 72. 1805. Five species are described, *P. typhoideum*, *P. setosum*, *P. cenchroides*, *P. orientale*, and *P. violaceum*. *Pennisetum typhoideum*, being a well-known economic species, is chosen as the type.

Penicillaria Willd., Enum. Pl. **2**: 1036. 1809. A single species, *P. spicatus*, based on *Holcus spicatus* L., is described.

Gymnothrix Beauv., Ess. Agrost. 59, pl. 13. f. 6. 1812. The type species is *G. thourii*, the one figured. Beauvois distinguished Gymnothrix from Pennisetum by the glabrous (not plumose) bristles.

The most important species of the genus is *Pennisetum glaucum* (L.) R. Br. (*P. typhoideum* Rich., *P. americanum* (L.) Schum., *Penicillaria spicata* (L.) Willd.), called in this country pearl millet (fig. 149). This is a robust annual, 4 to 8 feet tall, with broad blades like those of corn or sorghum, and a dense, erect, cylindric spikelike panicle as much as a foot long, the stem woolly below the spike, the involucre containing usually two spikelets about as long as the bristles. Pearl millet differs from the other Paniceae in having an enlarged caryopsis bursting through its lemma and palea. The caryopsis, or "seed," is deciduous by an articulation above the fertile lemma, the bristles and the floral bracts remaining on the spike. Pearl millet is widely cultivated in tropical Africa and Asia, the seed being used for human food. The species has been cultivated since prehistoric times, its wild prototype being unknown. In the United States pearl millet is used to a limited extent in the Southern States for forage, especially for soiling.

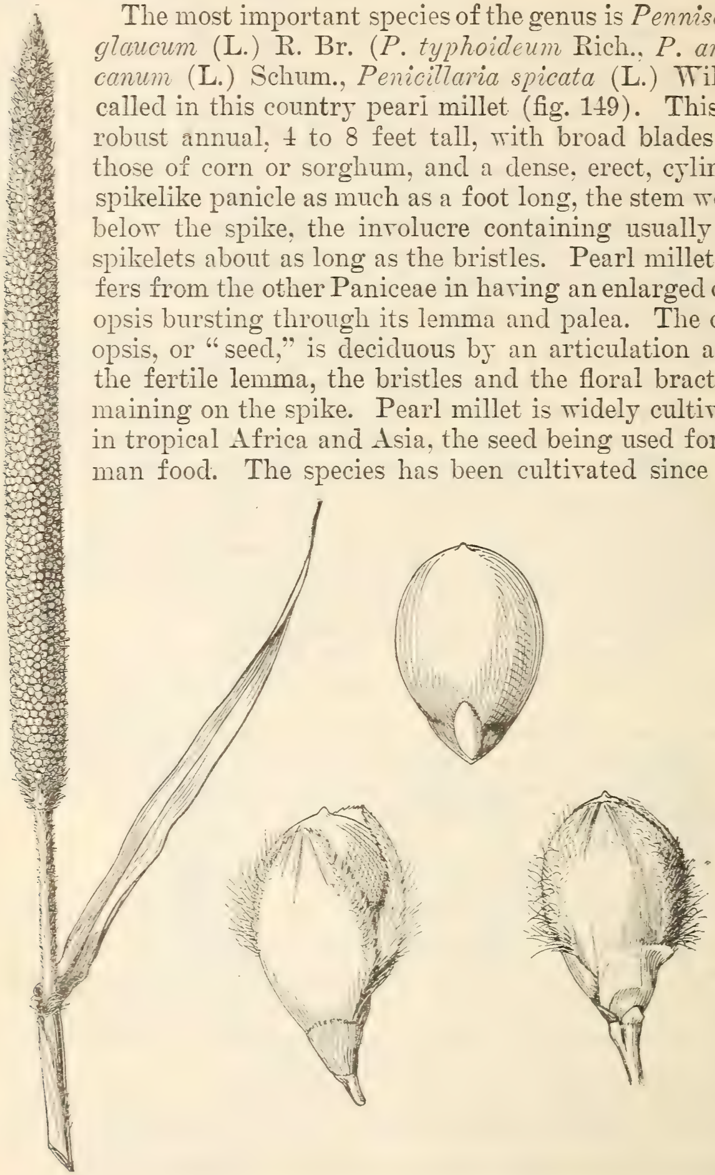

FIG. 149.—Pearl millet, *Pennisetum glaucum*. Inflorescence, × ½; two views of spikelet and caryopsis, × 10.

Panicum glaucum L. (Sp. Pl. 56. 1753), on which was based *Pennisetum glaucum*, was itself based on a citation from the Flora Zeylanica (Panicum spica tereti, involucris bifloris fasciculato-pilosis L. Fl. Zeyl. 18. 1747), which refers to the species afterwards described as *Pennisetum typhoideum.* Linnæus described two varieties of *Panicum glaucum*, these being now called *Chaetochloa viridis* and *C. lutescens.* Through an error the name *Panicum glaucum* has been applied by nearly all botanists to the latter species. When the species was transferred to Setaria and to Chaetochloa the error was perpetuated. Robert Brown transferred *Panicum glaucum* to Pennisetum but used the name in the erroneous sense, as is shown by his description. Nevertheless, Robert Brown must be credited with the name *Pennisetum glaucum* even though he described the wrong species. The only species of Pennisetum found native in the United States is *P. setosum* (Swartz) Rich. (fig. 150), of tropical America, which extends into southern Florida. Two species are cultivated for ornament. *Pennisetum villosum* R. Br. (*P. longistylum* of florists, not Hochst.) is a slender perennial 1 or 2 feet tall with a pale feathery head 2 to 4 inches long, the bristles 1 to 2 inches long. *Pennisetum ruppelii* Steud., fountain grass, with beautiful pink or purple nodding spikes, longer and more graceful than those of the preceding, is used for borders. An African species, Napier grass (*P. purpureum* Schum.), has been tested recently in the Southern States as a forage plant. It is a coarse perennial 8 to 12 feet tall.

126. CENCHRUS L.

Spikelets solitary or few together, surrounded and inclosed by a spiny bur composed of numerous coalescing bristles (sterile branchlets), the bur globular, the peduncle short and thick, articulate at base, falling with the spikelets and permanently inclosing them, the seed germinating within the old involucre, the spines usually retrorsely barbed.

Annual or sometimes perennial, commonly low branching grasses, with flat blades and racemes of burs, the burs readily deciduous. Species about 25, in the warmer parts of both hemispheres, but chiefly in America; 7 species in the United States, chiefly in the southern portion.

Type species: *Cenchrus echinatus* L.

Cenchrus L., Sp. Pl. 1049, 1753; Gen. Pl., ed. 5, 471. 1754. Linnæus describes five species, *C. racemosus*, *C. capitatus*, *C. echinatus*, *C. tribuloides*, and *C. frutescens.* The reference in the Genera Plantarum is to Panicastrella Mich. 31, that is, to plate 31 of Micheli's Nova Plantarum Genera, published in 1729. The account of the genus Panicastrella is on page 36. The two species here described are cited as synonyms by Linnæus, under *Cenchrus echinatus* and *C. tribuloides*, both being based on descriptions in Sloane's History of Jamaica. The first species, *C. echinatus*, is chosen as the type. *Cenchrus racemosus* is now referred to Nazia; *C. capitatus* to Echinaria. *Cenchrus frutescens*, of which there is no specimen in the Linnæan Herbarium, is uncertain. It is stated to come from America, but this is a misprint for Armenia, as is shown by the second edition of the Species Plantarum.

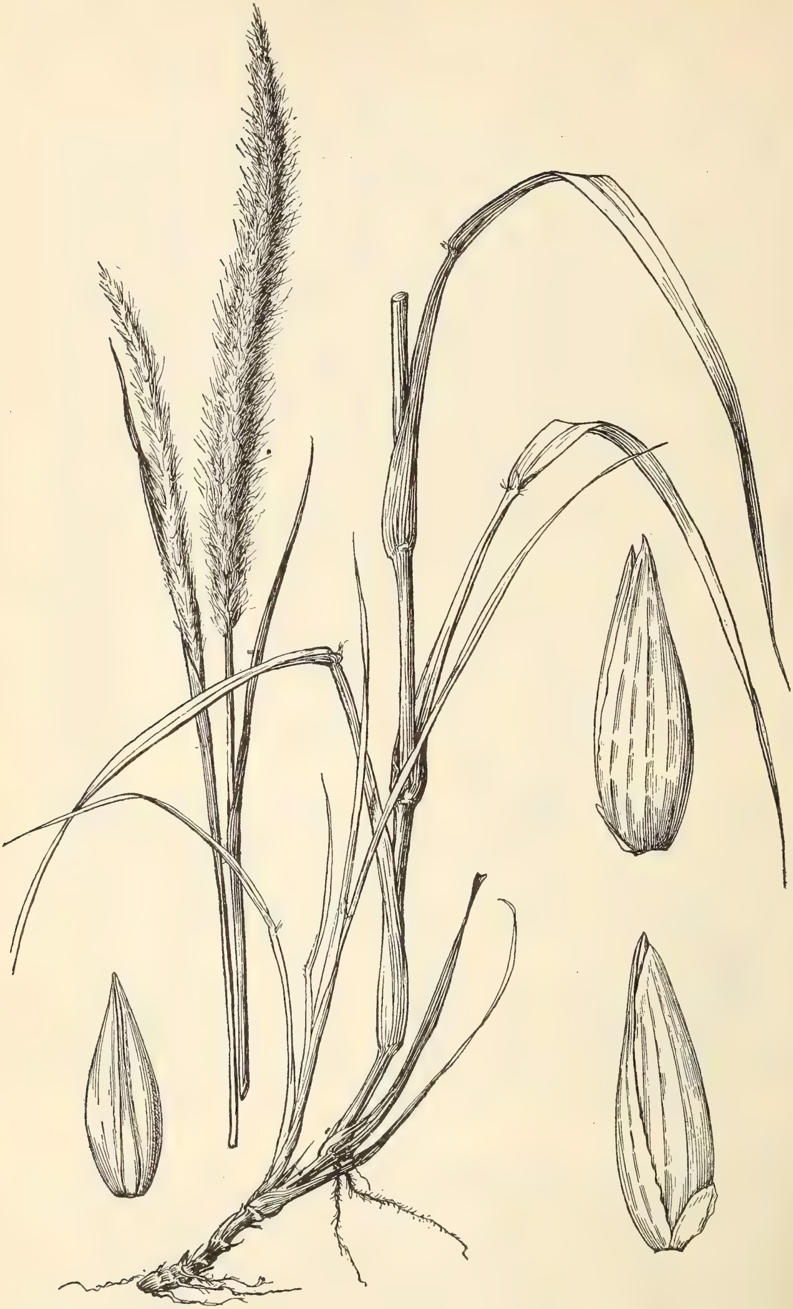

FIG. 150.—*Pennisetum setosum.* Plant, × ½; two views of spikelet and fertile floret, × 10.

Rarum Adans., Fam. Pl. 2: 35, 597. 1763. Of the four pre-Linnæan citations two are given by Linnæus under *Cenchrus echinatus*, which is taken as the type.

Cenchropsis Nash, in Small, Fl. Southeast. U. S. 109. 1903. *Cenchrus myosuroides* H. B. K. is designated as the type.

Nastus Lunell, Amer. Midl. Nat. 4: 214. 1915. The name is ascribed to Dioscorides and "*Cenchrus frutescens* Linn." given as the type. Lunell intends to apply the name to Cenchrus, but the designated type is unidentifiable and certainly is not a grass.

Most of the species of the United States are annual. *Cenchrus myosuroides* H. B. K. differs from our other species in the involucre, or bur, with bristles united only at the base. Were it not for certain species of Australasia which are intermediate, this species might be segregated under a distinct genus, as was done by Nash.[1] The original *C. tribuloides* L. (fig. 151) is a dune grass of the Atlantic coast, with large villous burs. The common sand bur of the interior found in sandy fields across the continent is *C. pauciflorus* Benth. This was formerly confused with *C. tribuloides* and more recently has been called *C. carolinianus* Walt., which proves to be a different species. *Cenchrus echinatus*, a common tropical species extending into the Southern States, has a less prickly bur, with a ring of slender bristles at the base of the stout prickles. The species of Cenchrus, especially the last two, are excellent forage grasses before the burs are formed. The genus has been revised by Nash.[2]

127. AMPHICARPON Raf.

Spikelets of two kinds on the same plant, one in a terminal panicle, perfect but not fruitful, the other cleistogamous on slender leafless subterranean branches from the base of the culm or sometimes also from the lower nodes; first glume of the aerial spikelets variable in size, sometimes obsolete; second glume and sterile lemma about equal; lemma and palea indurate, the margins of the lemma thin and flat; fruiting spikelets much larger, the first glume wanting; second glume and sterile lemma strongly nerved, subrigid, exceeded at maturity by the turgid, elliptic, acuminate fruit with strongly indurate lemma and palea, the margins of the lemma thin and flat; stamens with small anthers on short filaments.

Annual or perennial erect grasses, with flat blades and narrow terminal panicles. Species two, in the Atlantic Coastal Plain region of the United States.

Type species: *Milium amphicarpum* Pursh.

Amphicarpon Raf., Amer. Month. Mag. 2: 175. 1818. In a review of Pursh's Flora of North America, Rafinesque indicates that *Milium amphicarpon* should be a new genus, Amphicarpon Raf. Kunth[3] published the genus Amphicarpum, based on the same type, apparently ignorant of Rafinesque's proposed name.

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[1] *Censhropsis myosuroides* (H. B. K.) Nash, in Small, Fl. Southeast, U. S. 109. 1903.

[2] Bull. Torrey Club 22: 298–301. 1895.

[3] Rev. Gram. 1: 28. 1829.

The two species are *Amphicarpon purshii* Kunth (*A. amphicarpon* (Pursh) Nash), an annual (fig. 152), with hirsute blades, found from New Jersey to Florida, and *A. floridanum* Chapm., a stoloniferous perennial, with glabrous blades, confined to Florida. The latter often provides abundant pasture.

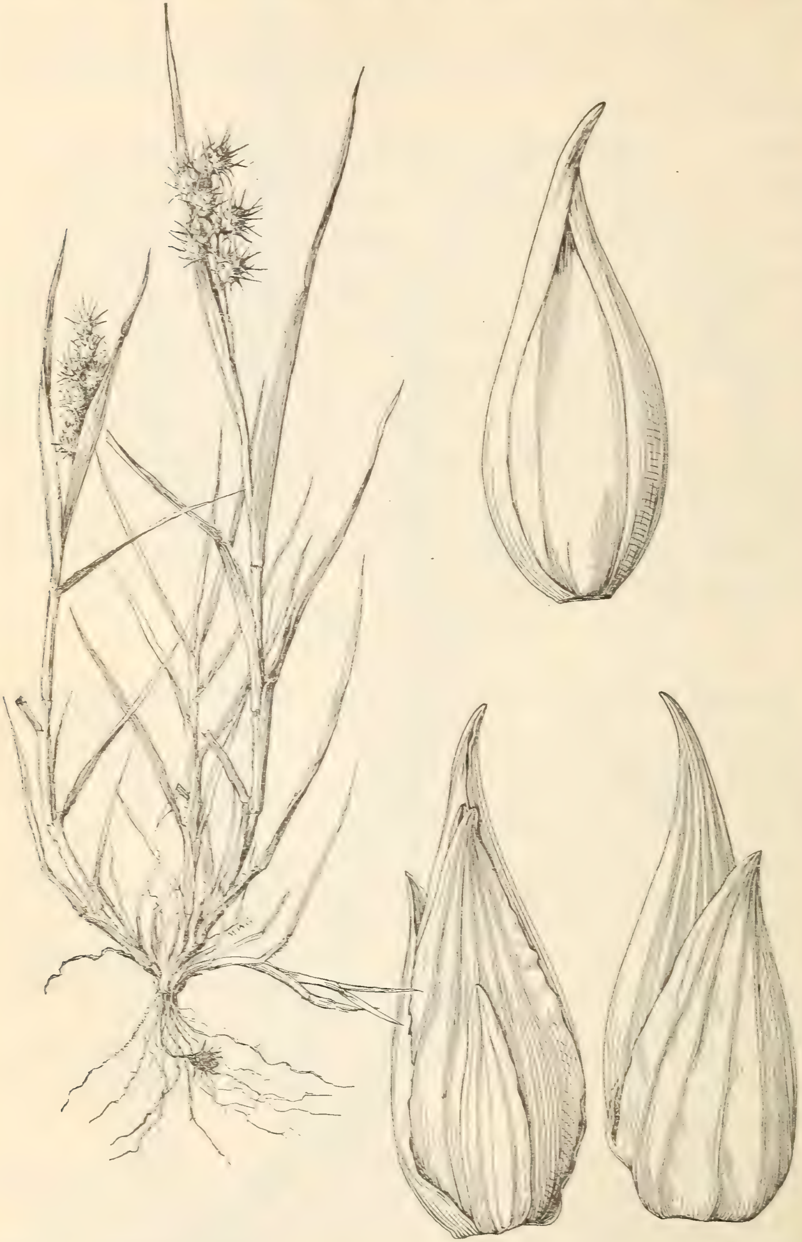

FIG. 151.—*Cenchrus tribuloides.* Plant, × ½; two views of spikelet and fertile floret, × 10.

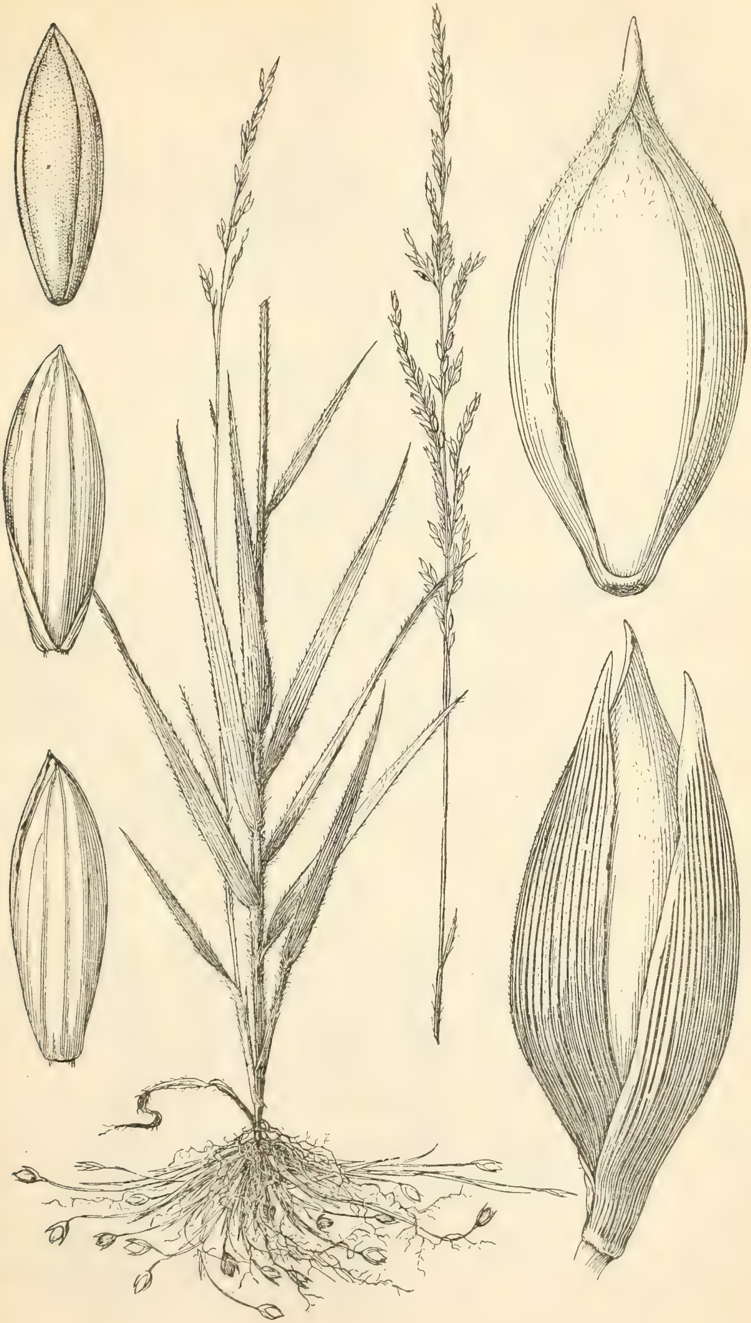

Fig. 152.—*Amphicarpon purshii.* Plant, × ½; two views of aerial spikelet and floret and the subterranean spikelet and fertile floret, × 10.

Olyra L., Syst. Nat., ed. 10, 2:1261. 1759. A tropical American genus, one species of which, *O. latifolia* L. (fig. 153) is credited to Florida by Small in his Flora of the Southeastern United States. The record is doubtful.

A glabrous perennial, bamboolike in aspect, as much as 15 feet tall, the branches straggling over shrubs; blades petiolate, asymmetrically lanceolate-oblong, as much as 8 inches long and 2 inches wide; panicles 4 to 6 inches long, the branches stiffly ascending or spreading, each bearing a single, large, long-acuminate, pistillate spikelet at the thickened summit and several small slender-pediceled staminate spikelets along the branch.

13. ANDROPOGONEAE, THE SORGHUM TRIBE.

128. Imperata Cyrillo.

Spikelets all alike, awnless, in pairs, unequally pedicellate on a slender continuous rachis, surrounded by long silky hairs; glumes about equal, membranaceous; sterile lemma, fertile lemma, and palea thin and hyaline.

Perennial, slender, erect grasses, with terminal narrow woolly panicles. Species seven, in the tropical regions of both hemispheres; two species in the United States, three others in tropical America.

Type species: *Lagurus cylindricus* L.

Imperata Cyrillo, Pl. Rar. Neap. 2: 26. 1792. A single species is described, *I. arundinacea* Cyrillo, but the genus is based upon *Lagurus cylindricus* L.[1]

Our species are *Imperata brasiliensis* Trin., in southern Florida, and *I. hookeri* Rupr. (fig. 154), from western Texas to southern California. They are not found in sufficient abundance to be of agricultural value.

129. Miscanthus Anderss.

Spikelets all alike, in pairs unequally pedicellate along a slender continuous rachis; glumes equal, membranaceous or somewhat coriaceous; sterile lemma a little shorter than the glumes, hyaline; fertile lemma hyaline, smaller than the sterile lemma, extending into a delicate bent and flexuous awn; palea small and hyaline.

Robust perennials, with long flat blades and terminal panicles of aggregate spreading slender racemes, our species with a tuft of silky hairs at the base of the spikelet, surrounding it and of about the same length as the glumes, the palea of the short-pedicellate spikelet about one-fourth as long as the lemma, the palea of the long-pedicellate spikelet obsolete. Species about eight, in southeastern Asia and South Africa; one cultivated in the United States.

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[1] Cyrillo gives the generic heading thus: "Imperata. *Lagurus cylindricus* Linn., Sp. Pl. 120, n. 2."

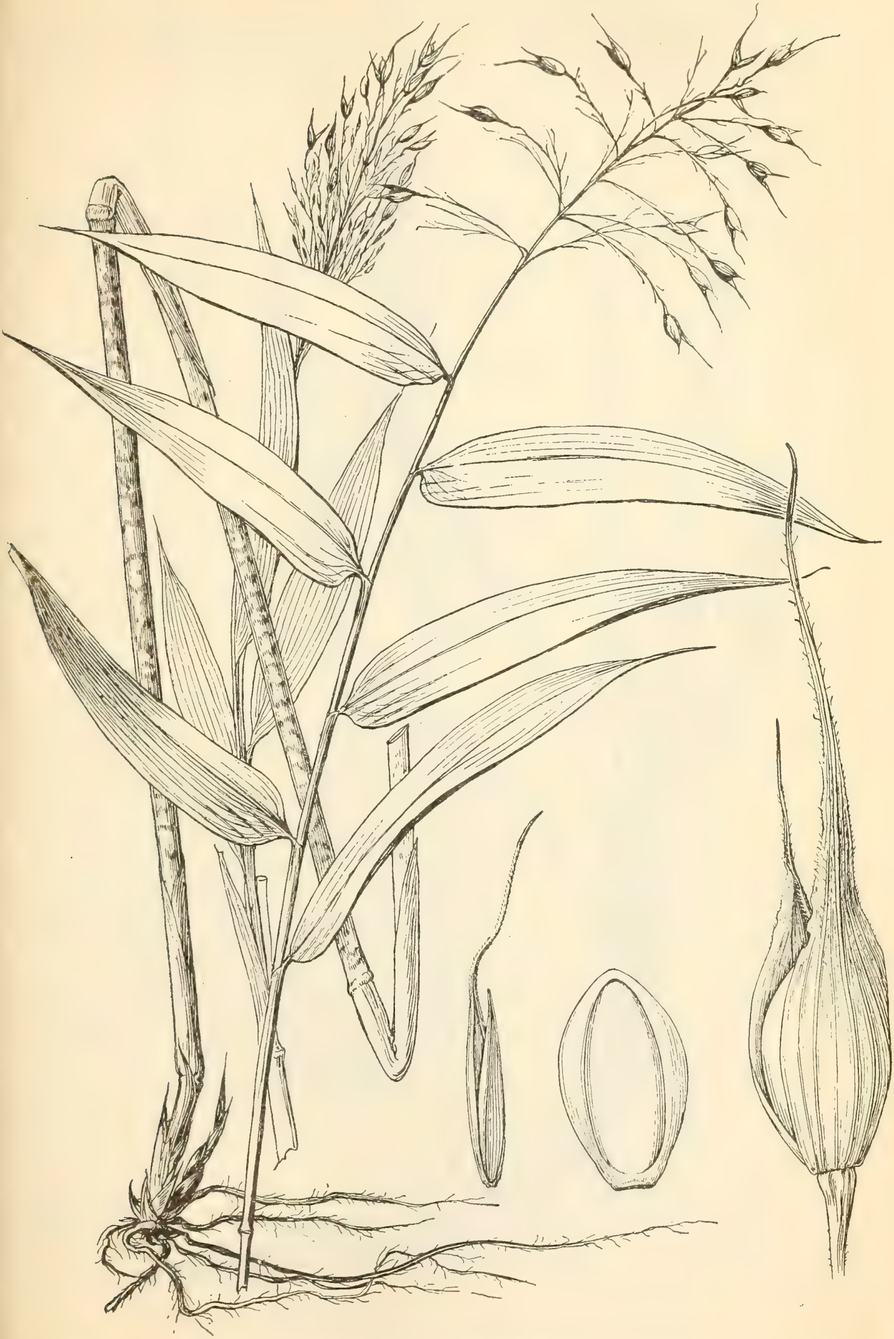

FIG. 153.—*Olyra latifolia.* Plant, × ½; pistillate spikelet, fertile floret, and staminate spikelet, × 5.

Type species: *Miscanthus japonicus* Anderss.

Miscanthus Anderss., Ofv. Svensk. Vet. Akad. Forh. **1855:** 165. 1856. Andersson describes five species, *M. capensis*, *M. japonicus*, *M. luzonensis*, *M. sinensis*, and *M. purpurascens*. Andersson states that *M. capensis* is a transition from this group to the other genera of the tribe; hence this species may be excluded from consideration in selecting the type of the genus. The second species, *M. japonicus*, is therefore selected as the type.

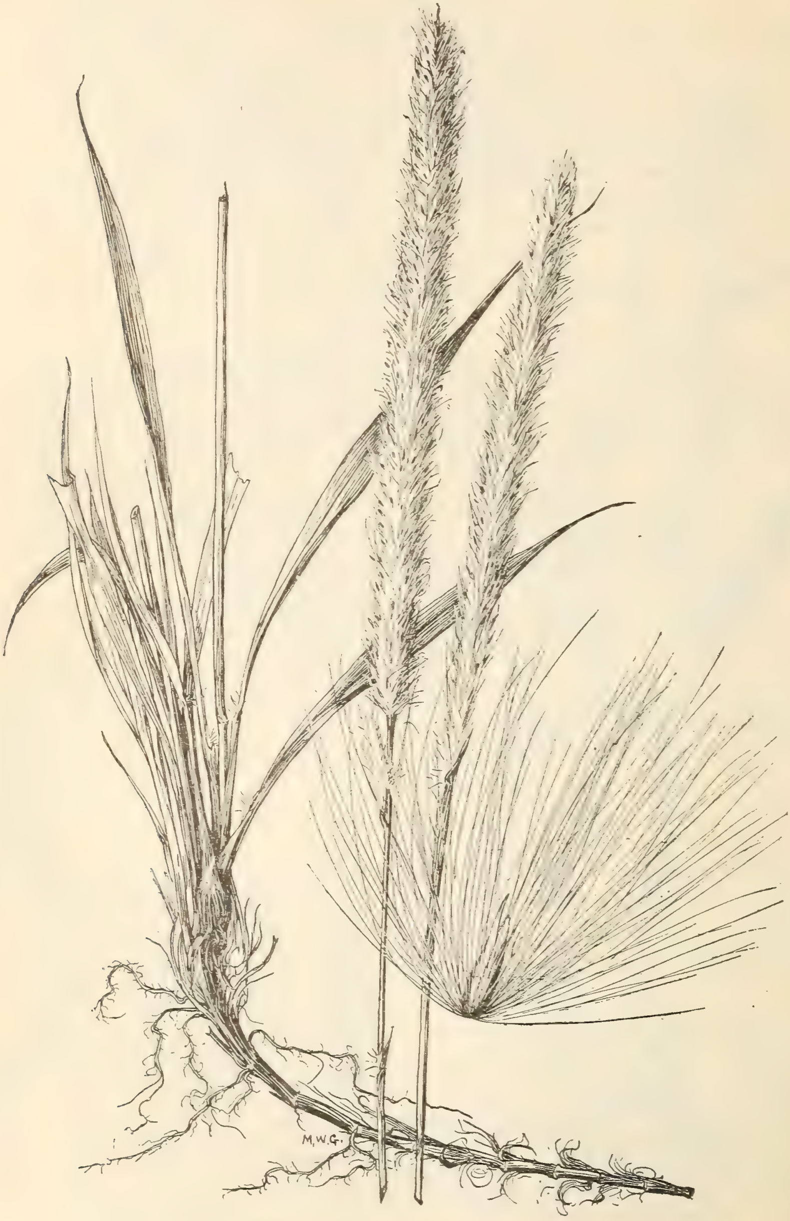

FIG. 154.—*Imperata hookeri*. Plant, × ½; spikelet, × 5.

Xiphagrostis Coville, Contr. U. S. Nat. Herb. **9:** 399, pl. 69. 1905. Two species are included, *X. floridula* (Labill.) Coville and *X. japonica* (Thunb.) Coville. *Saccharum floridulum* Labill., on which the first species is based, is designated as the type. Coville assumed *M. capensis* to be the type of Miscanthus, as it was the first species described (see Miscanthus, p. 254), and referred *Miscanthus sinensis* and its allies, which were not congeneric with *M. capensis*, to Xiphagrostis.

Miscanthus sinensis Anderss. (Pl. XVIII; fig. 155) is cultivated in the United States as an ornamental. Commercially it is known as *Eulalia japonica* or merely eulalia. This is a reedy grass 4 to 8 feet high, growing in large bunches, with flat mostly basal blades, 2 to 3 feet long and about half an inch wide, gradually narrowed to a slender point, the panicle somewhat fan shaped, consisting of numerous silky racemes 4 to 8 inches long, aggregate at the summit of the culm. Eulalia has escaped from cultivation and is found growing wild in some localities. There are two varieties of *Miscanthus sinensis* with variegated leaves, var. *variegatus* Beal, with striped blades, and var. *zebrinus* Beal, with banded blades. *Miscanthus sinensis gracillimus* is a variety with very narrow blades. Another species, *M. nepalensis* (Trin.) Hack., is occasionally cultivated under the name of Himalaya fairy grass. This has spikelets about one-fourth as long as the hairs at their base.

130. SACCHARUM L.

Spikelets in pairs, one sessile, the other pedicellate, both perfect, awnless, arranged in panicled racemes, the axis disarticulating below the spikelets; glumes somewhat indurate, sterile lemma similar but hyaline; fertile lemma hyaline, sometimes wanting.

Perennial grasses of tropical regions, including about 10 species.

Type species: *Saccharum officinarum* L.

Saccharum L., Sp. Pl. 54, 1753; Gen. Pl., ed. 5, 28. 1754. Two species are described. The first is chosen as the type, because it is a well-known economic species. The second species, *S. spicatum*, is now referred to the genus Imperata.

Saccharum officinarum (fig. 156), the sugar cane, is cultivated in Louisiana and to a limited degree in some of the other Gulf States. It is a tall stout grass, 8 to 15 feet tall or even taller, with solid juicy stems, broad flat blades, and large plumelike panicles 1 to 2 feet long, with numerous small spikelets about 3 mm. long, each surrounded at the base by a tuft of silky hairs two or three times as long as the spikelet. The glumes and the delicate sterile lemma are about the same length, the fertile lemma and palea being absent. Sugar cane is cultivated chiefly for the production of sugar and molasses; but, especially in the Gulf States outside of Louisiana, it is also used for forage.

131. ERIANTHUS Michx.

Spikelets all alike, in pairs along a slender axis, one sessile, the other pedicellate, the rachis disarticulating below the spikelets, the rachis

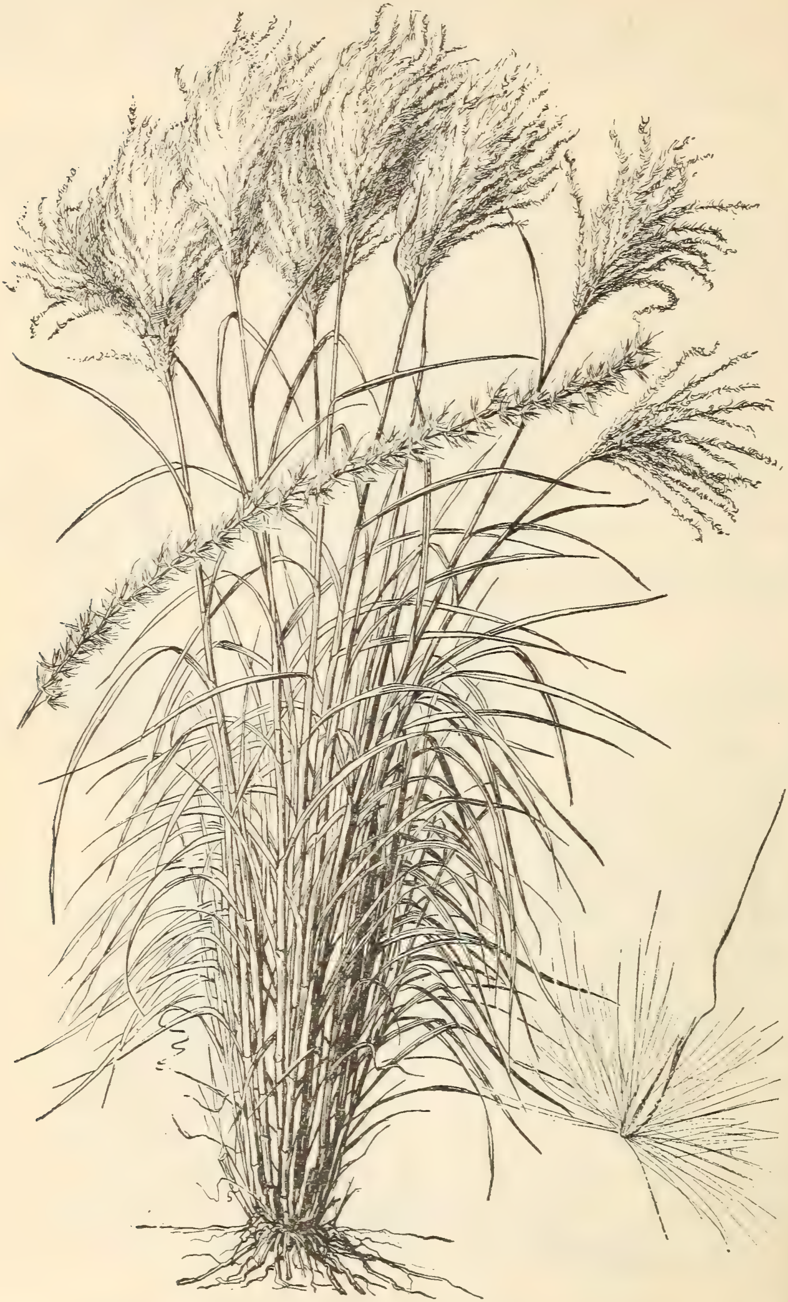

FIG. 155.—Eulalia, *Miscanthus sinensis*. Sketch of several stems, much reduced; branch of panicle, × ½; spikelet, × 5.

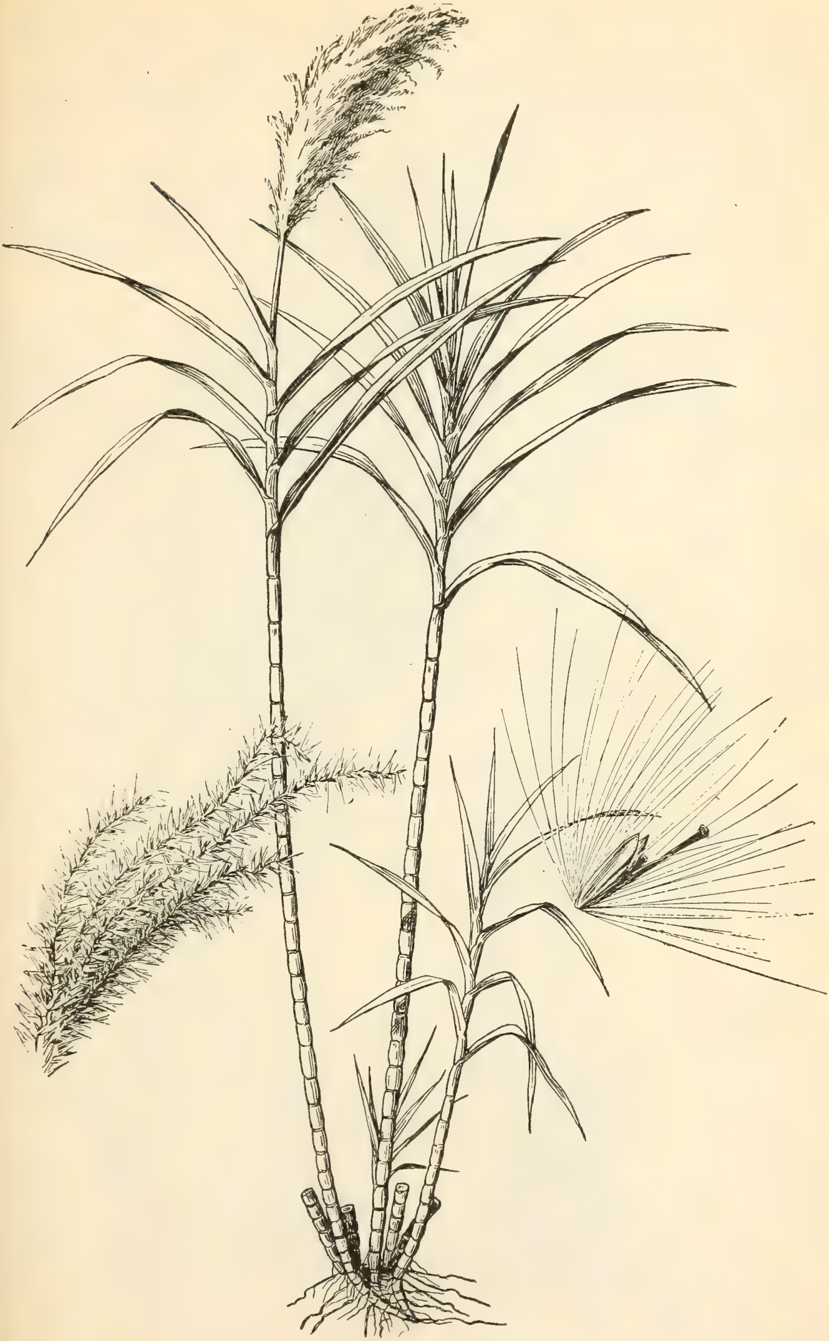

FIG. 156.—Sugar cane, *Saccharum officinarum*. Sketch of three stems, much reduced; a few branches of panicle, × ½; spikelet with pedicel of second spikelet (the shorter) and joint of rachis, × 5.

joint and pedicel falling attached to the sessile spikelet; glumes coriaceous, equal, usually copiously clothed, at least at the base, with long silky spreading hairs; sterile lemma thin and hyaline; fertile lemma hyaline, the midnerve extending into a slender awn; palea small and hyaline.

Perennial reedlike grasses, with flat blades and terminal oblong, usually dense silky panicles. Species about 20, in the warmer regions of both hemispheres; five in the United States, mostly in the Atlantic Coastal Plain.

Type species: *Erianthus saccharoides* Michx.

Erianthus Michx., Fl. Bor. Amer. 1: 54. 1803. Michaux describes two species, *E. saccharoides* and *E. brevibarbis.* He derives the name of the genus from two Greek words which mean hairy flower, because of the very densely villous involucre below the spikelets, and he remarks that the genus is closely allied to Saccharum. The first species, with long involucral hairs, he names *saccharoides*, and the second, with short hairs, *brevibarbis.* The first species, better representing Michaux's idea of the genus, is chosen as the type.

The commonest native species is *Erianthus saccharoides* (fig. 157), with straight awns and woolly panicles. *Erianthus divaricatus* (L.) Hitchc., with pale panicles, and *E. contortus* Baldw., with dark panicles, have flat, twisted awns. *Erianthus strictus* Baldw. has naked spikelets, and *E. brevibarbis* Michx. has short hairs at the base of the spikelets. The plants are too coarse to be of value for grazing, but some of our native species might well be cultivated for ornament.

One species, *E. ravennae* (L.) Beauv., a native of the Mediterranean region, is occasionally cultivated for ornament because of the silky plumes. It is called Ravenna grass and also by the less distinctive names, plume-grass and hardy pampas grass. The culms are several feet high, growing in large clumps, with blades about half an inch wide, tapering into a long slender point, the plume being as much as 2 feet long.

132. ANDROPOGON L.

Spikelets in pairs at each node of an articulate rachis, one sessile and perfect, the other pedicellate and either staminate, neuter, or reduced to the pedicel, the rachis and the pedicels of the sterile spikelets often villous, sometimes conspicuously so; glumes of the fertile spikelet coriaceous, narrow, awnless, the first rounded, flat, or concave on the back, several-nerved, the median nerve weak or wanting; sterile lemma shorter than the glumes, empty, hyaline; fertile lemma hyaline, narrow, entire or bifid, usually bearing a bent and twisted awn from the apex or from between the lobes; palea hyaline, small or wanting; pedicellate spikelet awnless, sometimes staminate and about as large as the sessile spikelet, sometimes consisting of one or more reduced glumes, sometimes wanting, only the pedicel present.

Rather coarse perennials (in the United States), with solid culms, the spikelets arranged in racemes, these numerous, aggregate on an

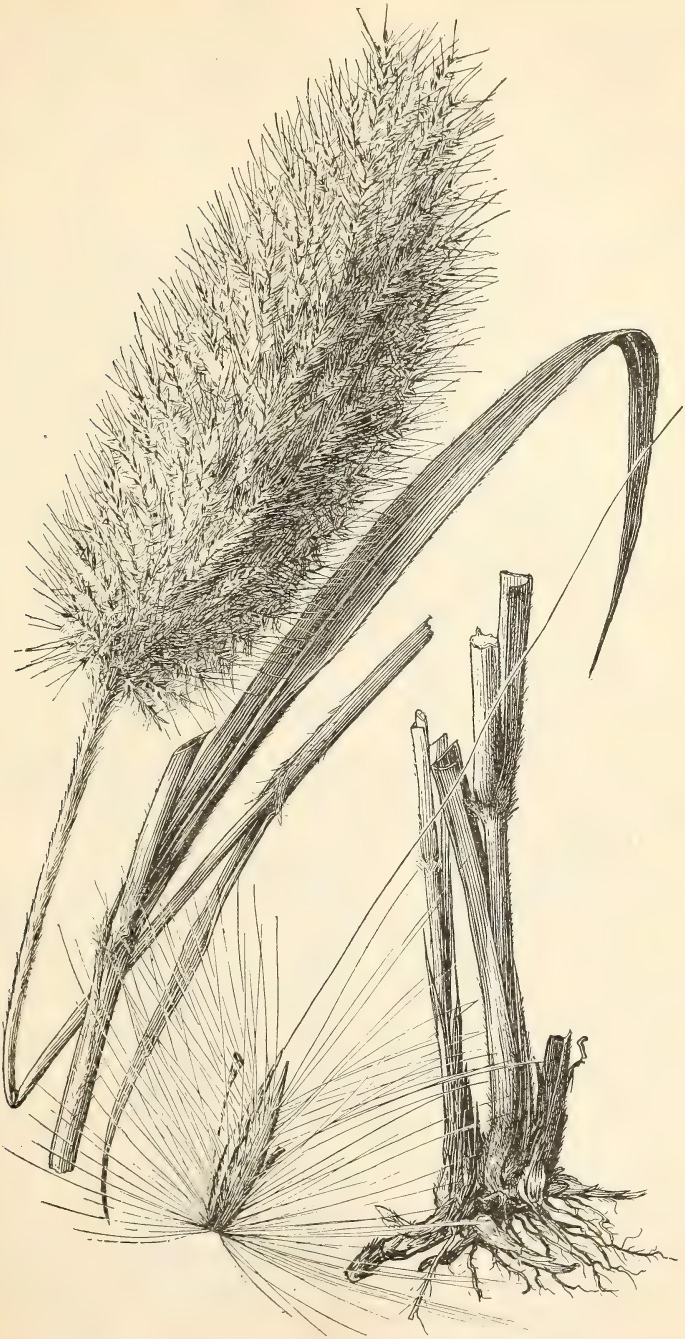

Fig. 157.—Plume-grass, *Erianthus saccharoides*. Plant, × ½; spikelet with pedicel (at right) and joint of rachis, × 5.

exserted peduncle, or single, in pairs, or sometimes in threes or fours, the common peduncle usually inclosed by a spathelike sheath, these sheaths often numerous, forming a compound inflorescence, usually narrow, but sometimes in dense subcorymbose masses. Species about 150, in all warmer parts of the world; about 30 species in the United States, mostly in the South.

Type species *Andropogon virginicus* L.

Andropogon L., Sp. Pl 1045, 1753; Gen. Pl., ed. 5, 468. 1754. Linnæus describes 12 species. The reference in the Genera Plantarum is to "Roy. lugdb. 52." In this work, Flora Leydensis, published in 1740, Royen describes two species, the first of these is later (Species Plantarum) named *Andropogon hirtum* by Linnæus, and the second *A. virginicum*. The type should be chosen from these two. The two species appear to be equally familiar to Royen and to Linnæus, though *A. virginicus* is more fully described and has priority of position in the Species Plantarum. *Andropogon virginicus* is chosen as the type, as this choice retains the generic name for its usual signification. Of the 12 species originally described, 4 are retained in Andropogon, *A. distachyos*, *A. virginicus*, *A. bicornis*, and *A. ischaemum*. *Andropogon contortus* is now referred to Heteropogon, *A. divaricatus* to Erianthus, *A. nutans* to Sorghastrum, *A. alopecuroides* to Erianthus, *A. schoenanthus*, *A. hirtus*, and *A. nardus* to Cymbopogon. *Andropogon fasciculatus*, the last species, is unidentifiable.

Schizachyrium Nees, Agrost. Bras. 331. 1829. The type species is *Andropogon condensatus* H. B. K., upon which is based *S. condensatum*, first of the six species described. Nees states, in a paragraph at the end of the generic description, that besides the species he enumerates *Andropogon brevifolius* belongs to Schizachyrium. Because of this statement Nash[1] chooses the latter species as the type. This group includes the species of Andropogon with racemes single at the ends of the branches.

Dimeiostemon Raf., Bull. Bot. Seringe **1**: 221. 1830. "Andropogon vaginatus Ell., A. sessiliflorus [nomen nudum], A. macrurus, A. vaginatus [repeated], A. tetrastachys" are listed. *Andropogon vaginatus* Ell., which is the same as *A. virginicus* L., is taken as the type.

Amphilophis Nash, in Britton, Man. 71. 1901. Only one species described, *Andropogon torreyanus* Steud. This group includes the species of Andropogon with numerous racemes in a naked panicle. Amphilophis was first used by Trinius[2] as a section of Andropogon.

Our species are divided into three groups: One (constituting the genus Schizachyrium of some authors) with the racemes single on each peduncle; two, with the racemes in pairs, or sometimes in threes or fours, on each peduncle; three, with the racemes aggregate toward the naked summit of the culms and branches. The commonest representative in the United States of the first group is *Andropogon scoparius* Michx. (fig. 158). This is an erect bunch-grass 2 to 4 feet high, the racemes scattered along the upper part of the stem. It is common throughout the eastern half of the United States. It is a fairly good forage grass and forms a part of the wild prairie hay in the eastern portion of the Great Plains, where it is called little bluestem. The second group is represented by numerous species in the Southern States. One of these, *A. virginicus* L. (fig. 159) is found in old fields, open woods, and sterile ground from Massachusetts to Texas and Florida. This is called broom sedge, though the name is also applied to some of the other species of Andropogon. *Andropogon virginicus* is a bunch-grass with tall slender culms, the feathery racemes in pairs, the rachis flexuous, the short common peduncle and usually the lower part of the racemes inclosed in the inflated sheathing bract, these bracts scattered along the culm on short branches. An allied species, *A. elliottii* Chapm., found in the Southeastern States, is distinguished by the conspicuously inflated upper foliage sheaths, the blade being often reduced to an appendage. Another important species, belonging to this group but differing in aspect from the

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[1] N. Amer. Fl. **17**: 100. 1912.

[2] Mém. Acad. St. Pétersb. VI. **2**: 285. 1832.

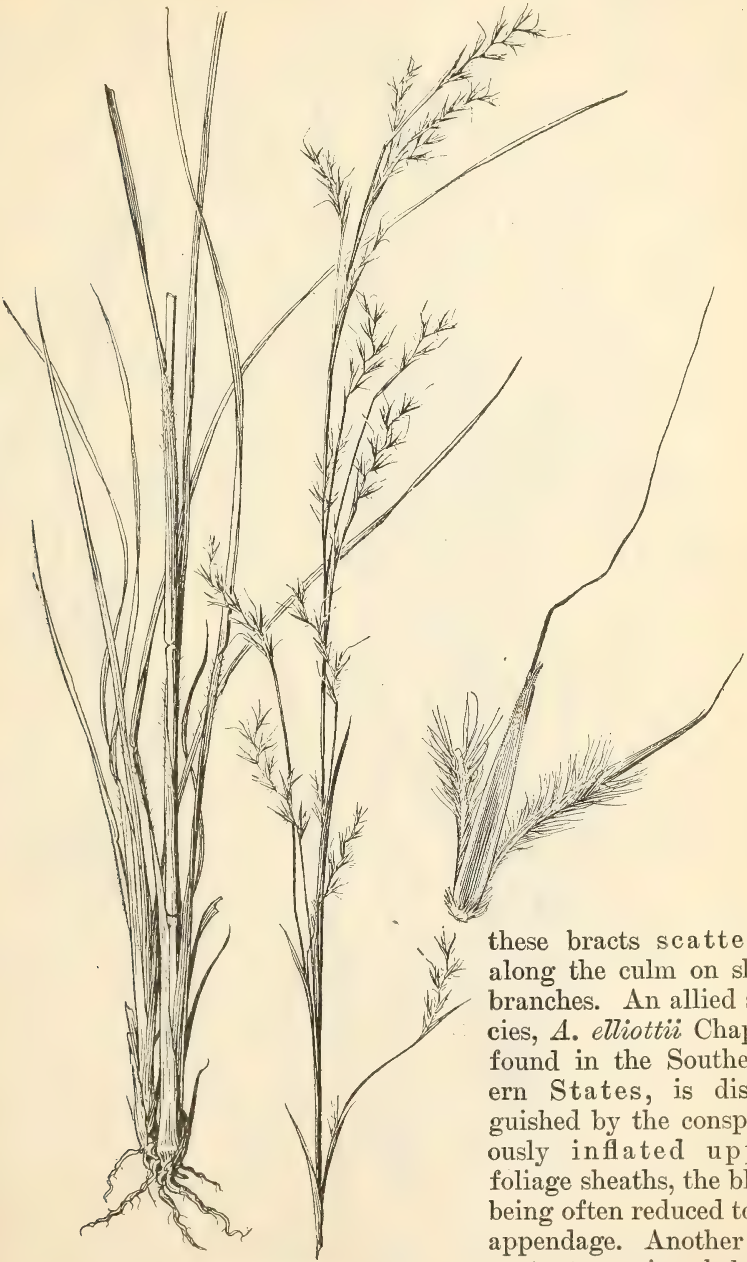

FIG. 158.—Little bluestem, *Andropogon scoparius*. Plant, × ½; pair of spikelets with joint of rachis (at left), × 5.

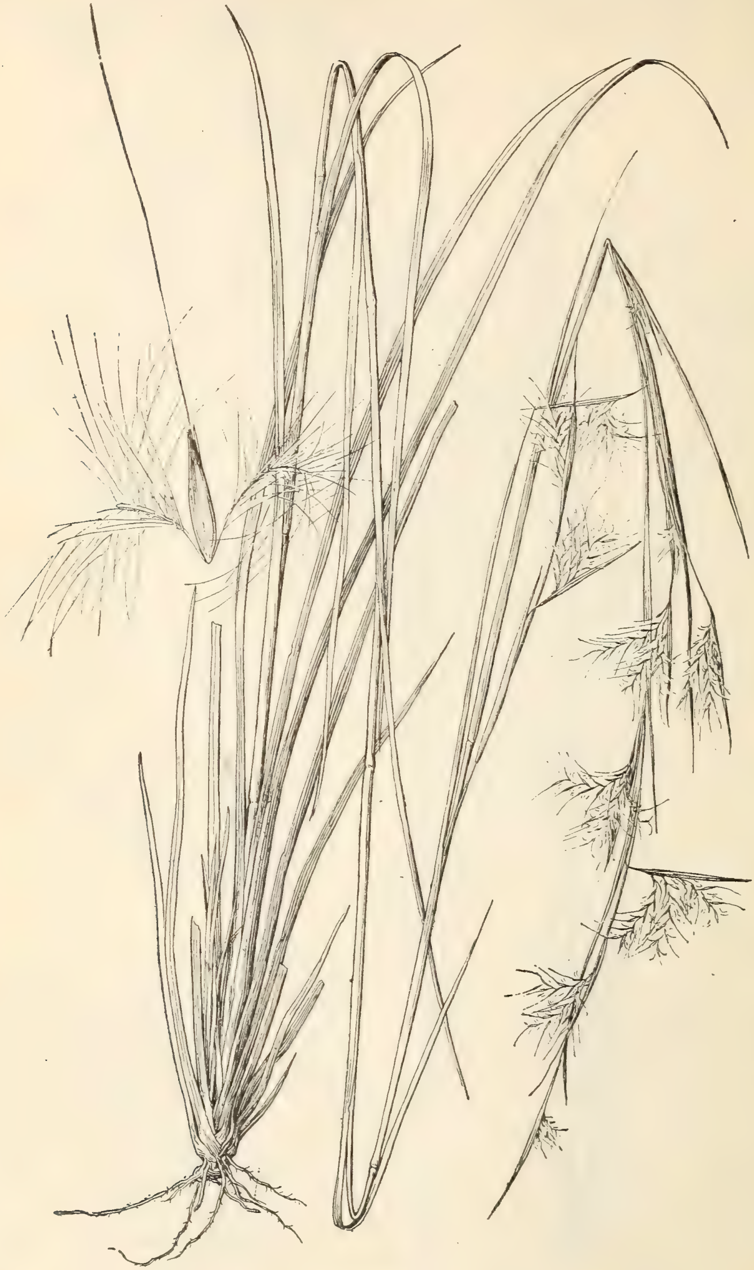

FIG. 159.—Broom sedge, *Andropogon virginicus*. Plant × ½; pair of spikelets with joint of rachis (at left), the second spikelet obsolete, the hairy pedicel only present, × 5.

last, is *A. furcatus* Muhl. (Pl. XIX; fig. 160). This grows throughout the eastern half of the United States and is an important forage grass in the western portion of its range. Here it is the chief constituent of prairie hay and is known as big bluestem. It is a tall, usually purplish bunch-grass, the racemes only slightly hairy, borne in twos to fours at the ends of the culms and the short branches, the rachis strict. In the Great Plains, grasses are popularly divided into tall grasses and short grasses. The former, of which *A. furcatus* is the most important, are found chiefly in the valleys and draws; the latter, including buffalo grass and grama grass, are found on the uplands. The third group of Andropogon is represented in this country by only three species, all extending northward from Mexico into the Southwestern States. The very hairy or feathery racemes are crowded in an oblong or somewhat flabellate white panicle terminating the main culm and its branches. One of these, *A. saccharoides* Swartz (fig. 161) (*A. argenteus* DC., *A. barbinodis* Lag.), is distinguished by the bearded nodes. *Andropogon saccharoides laguroides* (DC.) Hack. (*A. torreyanus* Steud.), with more slender culms and smooth nodes, is found as far north as Kansas. Another species of the group, *A. perforatus* Trin., of Mexico, rare in this country, differs in having a little pinhole or pit in the first glume.

An allied group of grasses is of importance in tropical parts of the Old World because of the essential oils obtained from them. They are included in Andropogon by some authors, but are referred by others to Cymbopogon. A full account of these grasses is given by Stapf.[1] The most important are citronella grass (*Andropogon nardus* L.; *Cymbopogon nardus* Rendle) and lemon grass (*Andropogon citratus* DC., *Cymbopogon citratus* Stapf). These are robust grasses with large compound inflorescences, the small racemes in pairs, each pair partly included in a sheathing spathe.

An allied genus, Anatherum Beauv., is represented by a single species, *A. zizanioides* (L.) Hitchc. and Chase (*Andropogon muricatus* Retz.; *Vetiveria zizanioides* Nash). This Old World grass is frequently cultivated in tropical America for hedges and for the aromatic roots, which are used for making screens and mats to perfume the air of houses. These roots readily impart perfume when wet. The grass is called vetiver, khus-khus, and khas-khas. It has escaped from cultivation in Louisiana. Vetiver is a robust grass with a large erect panicle, the slender whorled branches ascending, naked at the base, the awnless spikelets muricate.

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[1] Bull. Misc. Inf. Kew **1906**: 297. 1906.

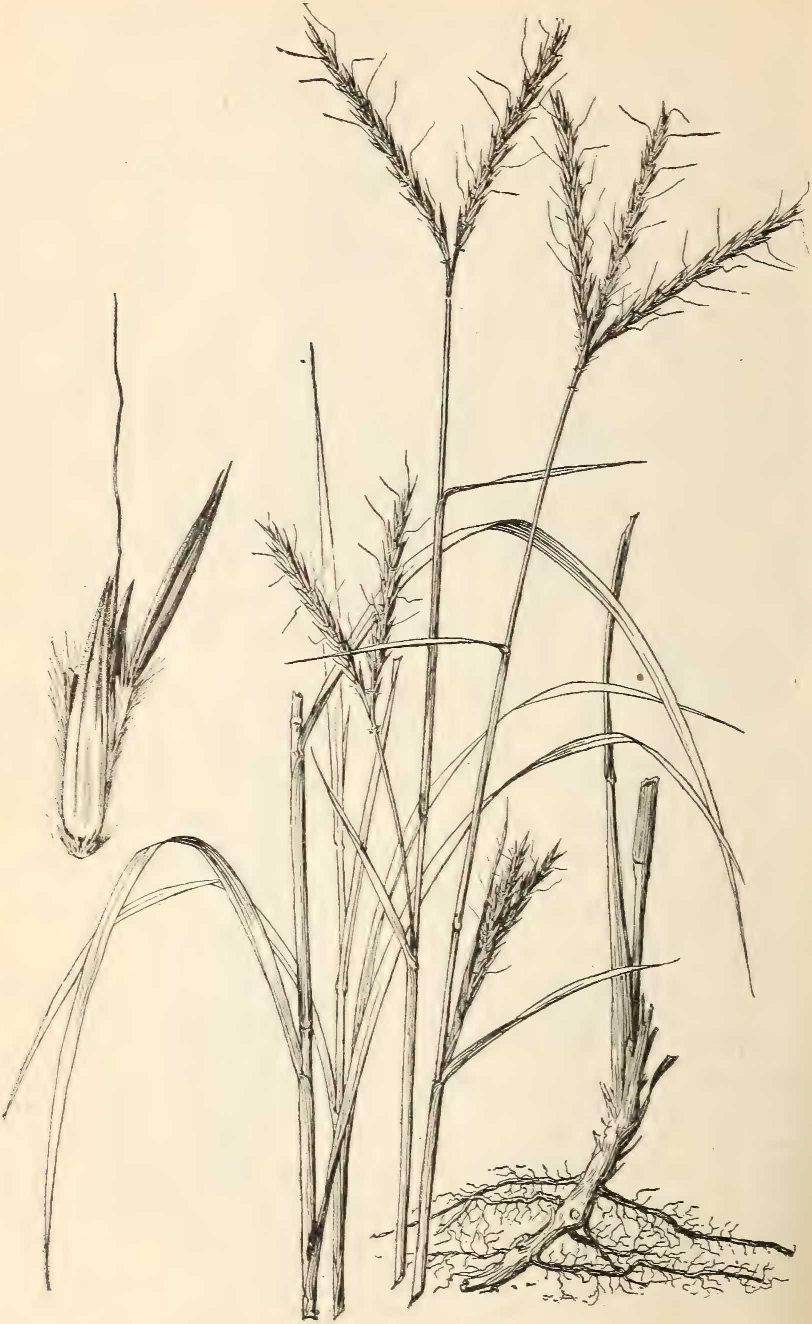
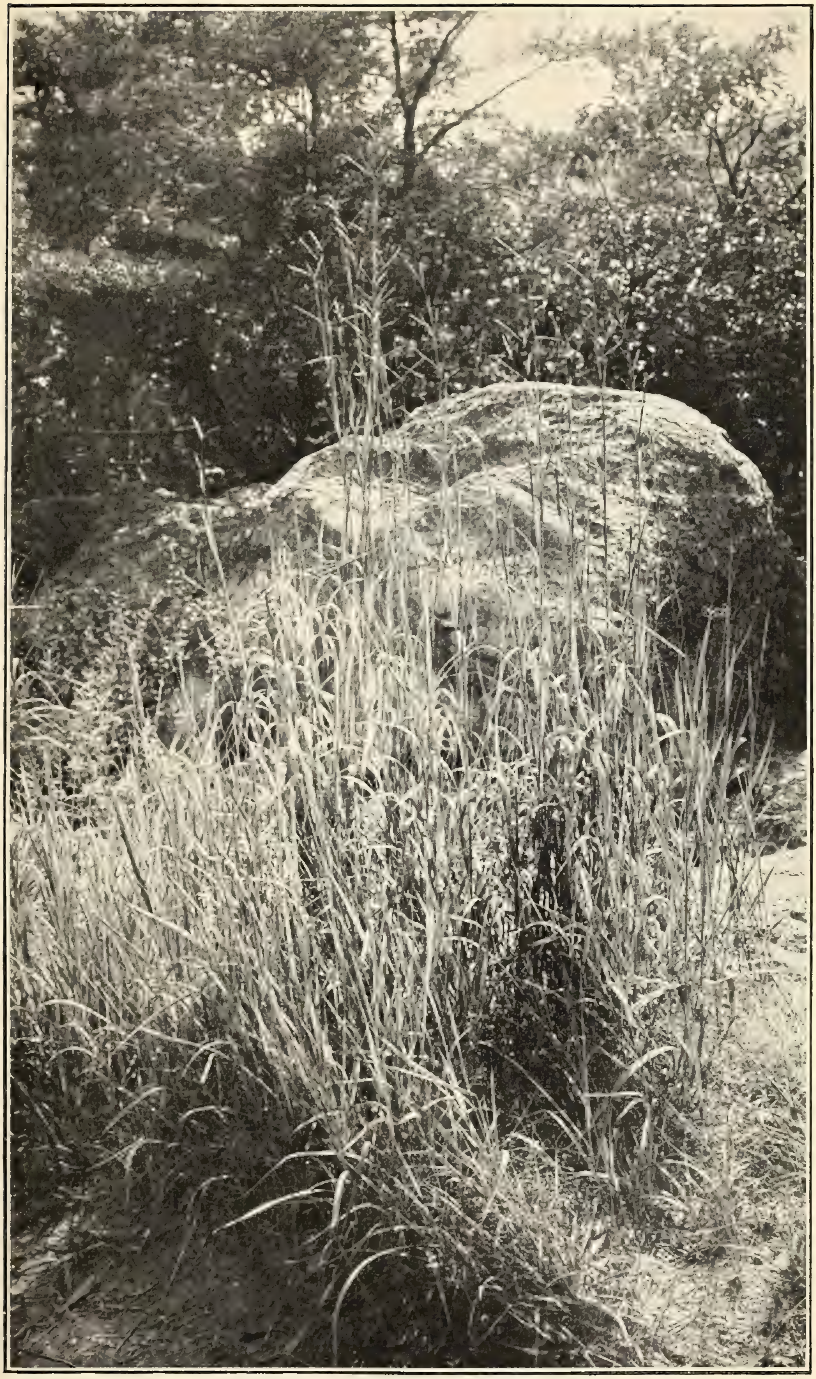
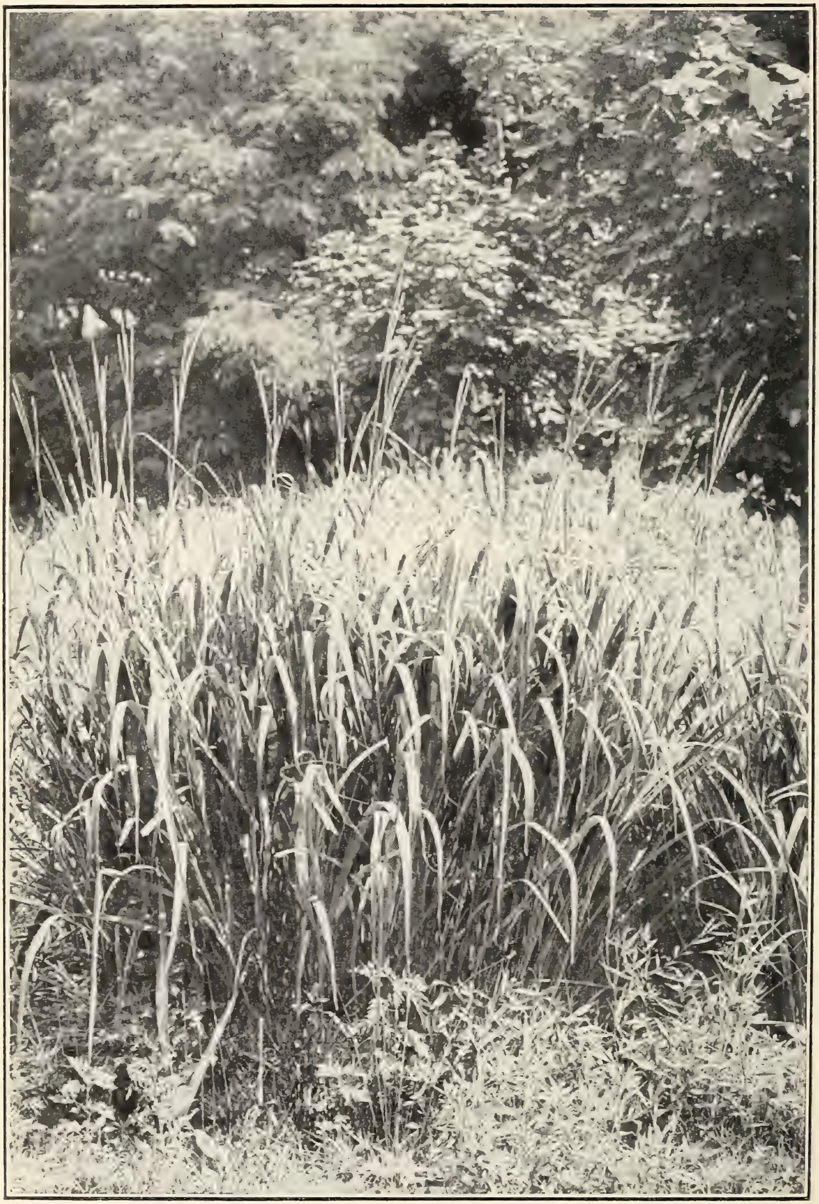


FIG. 160.—Big bluestem, *Andropogon furcatus.* Plant, × ½; pair of spikelets with joint of rachis, × 5.



BLUESTEM (ANDROPOGON FURCATUS).

Rocky banks of the Potomac. A valuable forage grass on the prairies of the Mississippi Valley.



GAMA GRASS (TRIPSACUM DACTYLOIDES). NEAR WASHINGTON, D. C.

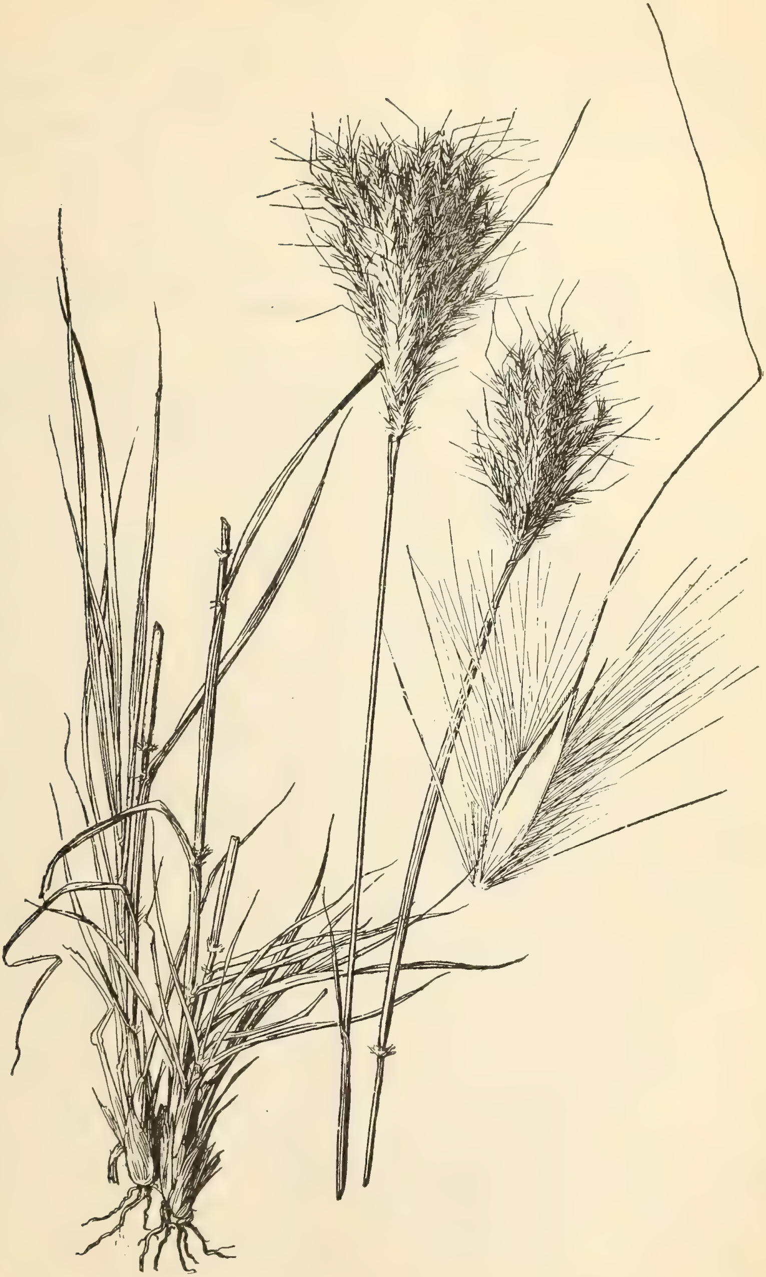


FIG. 161.—*Andropogon saccharoides.* Plant, × ½; pair of spikelets with joint of rachis (at left), the pedicellate spikelet showing a little at right, × 5.

Arthraxon Beauv., Ess. Agrost. 111. 1812. Type species, *A. ciliaris* Beauv. This Old World genus is represented in North America by *A. quartinianus* (A. Rich.) Nash, introduced into Jamaica and Guadaloupe, and by *A. ciliaris cryptatherus* Hack., established in the vicinity of Washington, D. C. The latter is a creeping slender grass with thin cordate-lanceolate blades, the inflorescence of several slender racemes in a cluster.

133. HOLCUS L.

(*Sorghum* Pers.)

Spikelets in pairs, one sessile and fertile, the other pedicellate, sterile but well developed, usually staminate, the terminal sessile spikelet with two pedicellate spikelets.

Annual or perennial, tall or moderately tall grasses, with flat blades and terminal panicles of 1 to 5 jointed tardily disarticulating racemes. Species about six, one Mexican, the others in the Old World; two cultivated or introduced into America.

Type species: *Holcus sorghum* L.

Holcus L., Sp. Pl. 1047, 1753; Gen. Pl., ed. 5, 469. 1754. Linnæus describes seven species, *H. sorghum, H. saccharatus, H. halepensis, H. lanatus, H. odoratus, H. laxus*, and *H. striatus*. The selection of the type species is of particular importance in this genus, because it affects the generic name of the group containing the cultivated sorghums. The first three of the original seven species were segregated from the others in 1763 by Adanson, who applied to them the old name sorghum, used by Bauhin and other pre-Linnæan authors for the cultivated sorghums. This name was accepted by most of those subsequent authors who recognized the group as a genus distinct from Andropogon, and as a subgeneric name by those who held it to be a subgenus of Andropogon. Of the remaining four of the original seven species of Holcus all but *H. lanatus* were early assigned to other genera, leaving *H. lanatus* in possession of the generic name and in effect making this residual species the type of the genus. Linnæus, however, in all the editions of the Genera Plantarum and in the Hortus Cliffortianus and the Hortus Upsaliensis used the name Holcus for sorghum only. The description and the synonymy in all cases apply only to the first three of the seven species included in the Species Plantarum. Moreover, in all the editions of the Genera Plantarum Linnæus cites " Sorgum Mich." While Micheli[1] gives no description or figure of the genus, we know from Bauhin and others that Sorgum or Sorghum was in common use for the group in question. Linnæus uses the old name Sorghum for the trivial or specific name of the first species, and cites Sorghum of Bauhin as a synonym. It is clear that the Holcus of Linnæus is the old Sorghum, the other four diverse species (which do not agree with the generic descriptions in any of the works cited), evidently being appended for want of a place to put them. According to the American Code the genera of Linnæus's Species Plantarum are to be typified through citations given in his Genera Plantarum of 1754. The reference to Micheli, the use of sorghum as a specific name, and the descriptions all point to *H. sorghum* as the type of the genus Holcus. *Holcus lanatus* is now referred to Notholcus, *H. odoratus* to Torresia (Hierochloë, Savastana), *H. laxus* to Uniola, and *H. striatus* to Sacciolepis. By many authors the genus Holcus as here understood is included under Andropogon.

Blumenbachia Koel., Descr. Gram. 28. 1802. A single species, " B. haleppensis," based on " Holcus Haleppensis Linn." is included.

Sorghum Pers., Syn. Pl. 1: 101. 1805. Four species are included. *Holcus sorghum* L., upon which *S. vulgare* Pers. is based, is taken as the type.

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[1] Nov. Plant. Gen. 35. 1729.

Holcus sorghum L. (*Andropogon sorghum* Brot.; *Sorghum vulgare* Pers.) has been cultivated from prehistoric times[1] for the seed, which has been used for food, for the sweet juice, and for forage. In the United States it is cultivated under the general name of sorghum or sorgo. There are many races and varieties, the chief of which are sorgo, kafir, milo, broom corn, shallu, kaoliang, and durra. Sorgo includes the varieties with sweet juice, these varieties often being known collectively as saccharine sorghums.

In this country sorgo is cultivated, chiefly in the region from Kansas to North Carolina, for the juice which is made into sirup and for foliage which is used for fodder in the Southern States, especially in the region from Kansas to Texas, where it is often called "cane." The other races of sorghum are often classed together as nonsaccharine sorghums. The large panicles of one race, broom corn, grown especially in Illinois, furnish the material for brooms. The other races are used for forage or for the seed, which is used for feed. Kafir, milo, and a recently introduced variety, feterita, are of especial value in the southern part of the Great Plains and other semiarid regions where dry-land farming is practiced. Kafir, or Kafir corn, is a rather low form with compact cylindric heads and awnless spikelets. Milo, or milo maize, is a usually taller form, with ovate heads, a straight or recurved peduncle, awned spikelets, and larger seeds. Durra differs from milo in having densely pubescent grayish or greenish glumes (instead of brown or black and slightly pubescent), and strongly flattened seeds. Some of these forms are called Egyptian corn, chicken corn, and Jerusalem corn. The name chicken corn should be restricted to a variety spontaneous in Louisiana and Mississippi (*Holcus sorghum drummondii* (Nees) Hitchc., *Andropogon drummondii* Nees, *A. sorghum drummondii* Hack.). A recently introduced variety, *Holcus sorghum sudanensis* (Piper) Hitchc. (*Andropogon sorghum sudanensis* Piper), is now extensively cultivated for hay in the semiarid regions under the name of Sudan grass. This is a rather slender annual, 6 to 9 feet tall, the panicle open and spreading. The absence of rhizomes shows its affinity to sorgo. Tunis grass is an allied variety (*Holcus sorghum exiguus* (Forsk.) Hitchc., *Holcus exiguus* Forsk., *Andropogon sorghum exiguus* Piper) that has been tried in our Southern States.

The second species of Holcus found in the United States is *H. halepensis* L. (fig. 162), known as Johnson grass. This is a perennial with stout creeping rhizomes. The panicle is open and spreading, the spikelets awned or awnless. Johnson grass is not so tall as the open-panicled forms of sorghum, being usually 3 to 5 feet tall, and

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[1] For a history and classification of sorghum, see Ball, U. S. Dept. Agr., Bur. Pl. Ind. Bull. 175. 1910.

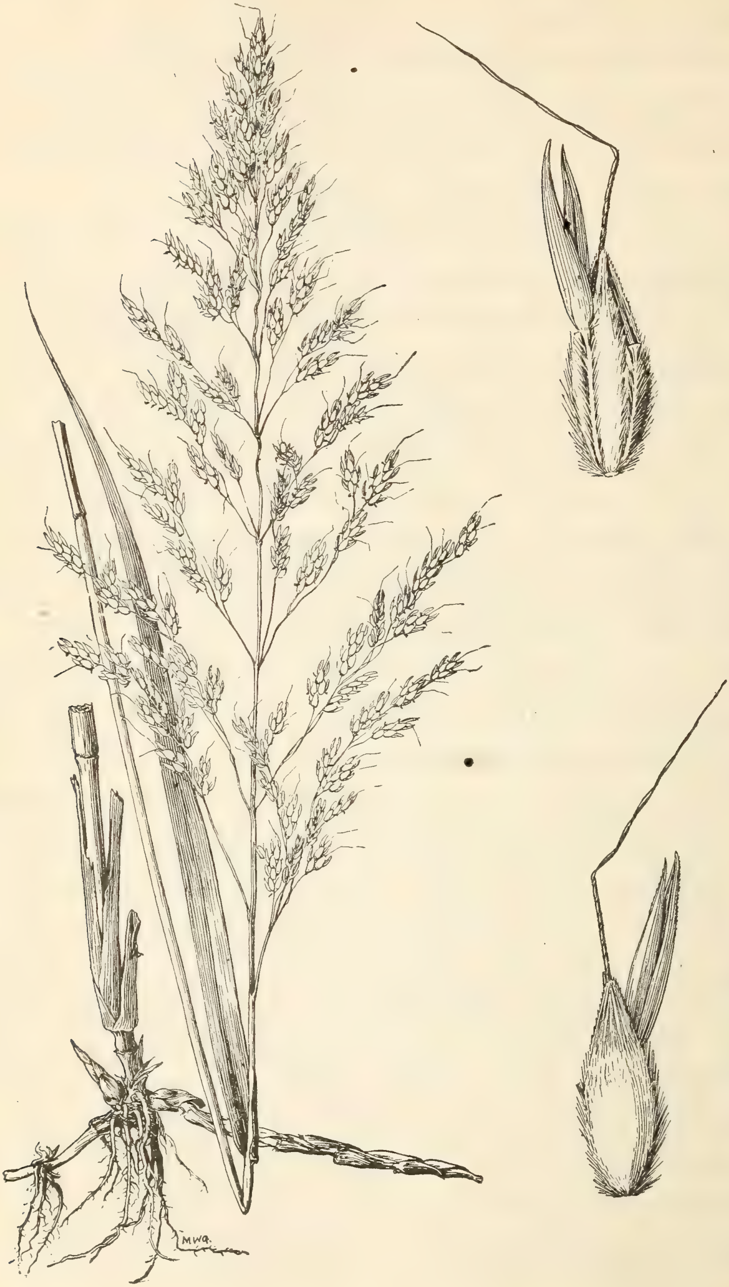

FIG. 162.—Johnson grass, *Holcus halepensis.* Plant, × ½; two views of terminal raceme, one of the pedicellate spikelets fallen, × 5.

has narrower blades than plants of sorghum of the same height. The characteristic difference is the presence of the creeping rhizomes in the former. Johnson grass is a native of the Mediterranean region, but is now widely distributed in the warmer parts of America. In the United States it is common throughout the South, where it is often a troublesome weed. It is an excellent and much-used forage grass, but the difficulty of eradicating it from ground that it has once occupied offsets its forage value. Johnson grass has become an especially pernicious weed on the Black Lands of Alabama and Texas.[1]

The sorghums and Johnson grass sometimes produce hydrocyanic acid in sufficient abundance, especially in second growth, to poison grazing animals.

134. SORGHASTRUM Nash.

Spikelets in pairs, one nearly terete, sessile, and fertile, the other wanting, only the hairy pedicel being present; glumes coriaceous, brown or yellowish, the first hirsute, the edges inflexed over the second; sterile and fertile lemmas thin and hyaline, the latter extending into a usually well-developed bent and twisted awn.

Perennial, erect, rather tall grasses, with narrow flat blades and narrow terminal panicles of one to few jointed racemes. Species about 10 in the warmer parts of the Western Hemisphere, and a few in Africa; 3 species in the United States east of the Rocky Mountains.

Type species: *Andropogon avenaceus* Michx.

Poranthera Raf., Bull. Bot. Seringe **1**: 221, 1830, not Rudge, 1811. "Andropogon nutans [L.] et ciliatus [Ell.])" are cited. These names apply to the same species, *Sorghastrum nutans* (L.) Nash.

Sorghastrum Nash, in Britton, Man. 71. 1901. Only one species described. *S. avenaceum* (Michx.) Nash.

Chalcoelytrum Lunell, Amer. Midl. Nat. **4**: 212. 1915. The name proposed to replace Sorghastrum Nash, which, being built on Sorghum, is considered undesirable.

The units of the inflorescence are racemes reduced to one or two joints, or in *Sorghastrum nutans* sometimes four or five. The slender, villous rachis disarticulates at the top of each joint, the spikelets falling with two villous stalks attached, one the rachis joint, the other the pedicel of the obsolete sterile spikelet. The articulation is more or less oblique, leaving a bearded blunt callus or, in some South American species, a long, sharp callus. In *S. nutans* the racemes not infrequently occur in pairs with a sessile spikelet in the fork, that is, the pedicel of the sterile spikelet of the lowest joint has been replaced by a short raceme of one or two joints.

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[1] For methods of eradication, see Cates and Spillman, U. S. Dept. Agr., Farmers' Bull. 279. 1907.

The commonest species of the genus in the United States is *Sorghastrum nutans* (L.) Nash (fig. 163), sometimes called Indian reed or Indian grass. This is a tall, erect grass with handsome bronze-colored panicles as much as a foot long, the awns about half an inch long, the anthers brilliant yellow. The species is found in prairies and open woods throughout the eastern United States and southwestward to Arizona and Mexico. It is a common constituent of prairie hay in the eastern part of the Great Plains region.

Two other species are found in the Southern States, both with awns about an inch long, *Sorghastrum elliottii* (C. Mohr) Nash, with pedicels villous only at the very tip, and *S. secundum* (Chapm.) Nash, with a one-sided panicle and pedicels villous along the upper portion.

135. Rhaphis Lour.

Spikelets in threes, one sessile and perfect, the other two pedicellate and sterile, or sometimes a pair below, one fertile and one sterile; fertile spikelet terete, the glumes coriaceous; sterile and fertile lemmas thin and hyaline, the latter long-awned.

Perennial grasses, or our species annual, with open panicles, the three spikelets (reduced racemes) borne at the ends of long, slender, naked branches. Species about 20, all in the tropical regions of the Eastern Hemisphere except the 1 found in the southern United States.

Type species: *Rhaphis trivialis* Lour.

Rhaphis Lour., Fl. Cochinch. 553. 1790. Only one species described, which is the same as *Andropogon aciculatus* Retz. Some authors have thought the name Rhaphis was invalidated by the earlier Rhapis L. f. (1789), a genus of palms. The names have a different derivation and a different pronunciation, and the one does not invalidate the other.

Pollinia Spreng., Pugill. 2: 10, 1815, not Pollinia Trin., 1832. Type species, *P. gryllus* Spreng. (*Andropogon gryllus* L.). Several species are described, but the generic characters are given under the first species.

Centrophorum Trin., Fund. Agrost. 106, pl. 5. 1820. Type species, *C. chinense* Trin. (*Andropogon aciculatus* Retz.), the only one described.

Chrysopogon Trin., Fund. Agrost. 187. 1820. Type species, *Andropogon gryllus* L. Two species are mentioned, *C. gryllus* and *C. aciculatus*, but an illustration of the first is cited.

The only species occurring in the United States is *Rhaphis pauciflora* (Chapm.) Nash (fig. 164), an annual found in Florida and Cuba. This has the aspect of a species of Stipa, the spikelets with their long awns and barbed callus resembling the fruit of *Stipa spartea*. The long slender branches of the few-flowered panicle bear a terete, brown, sessile fertile spikelet and two slender sterile pedicels, each with a slender glume. The peduncle disarticulates by a long oblique line through the thickened villous end, the portion separating with the spikelet being densely brown-villous, this forming a long sharp callus. The glumes are coriaceous and at maturity separate somewhat, the spikelet gaping at the apex. The palea is present, but

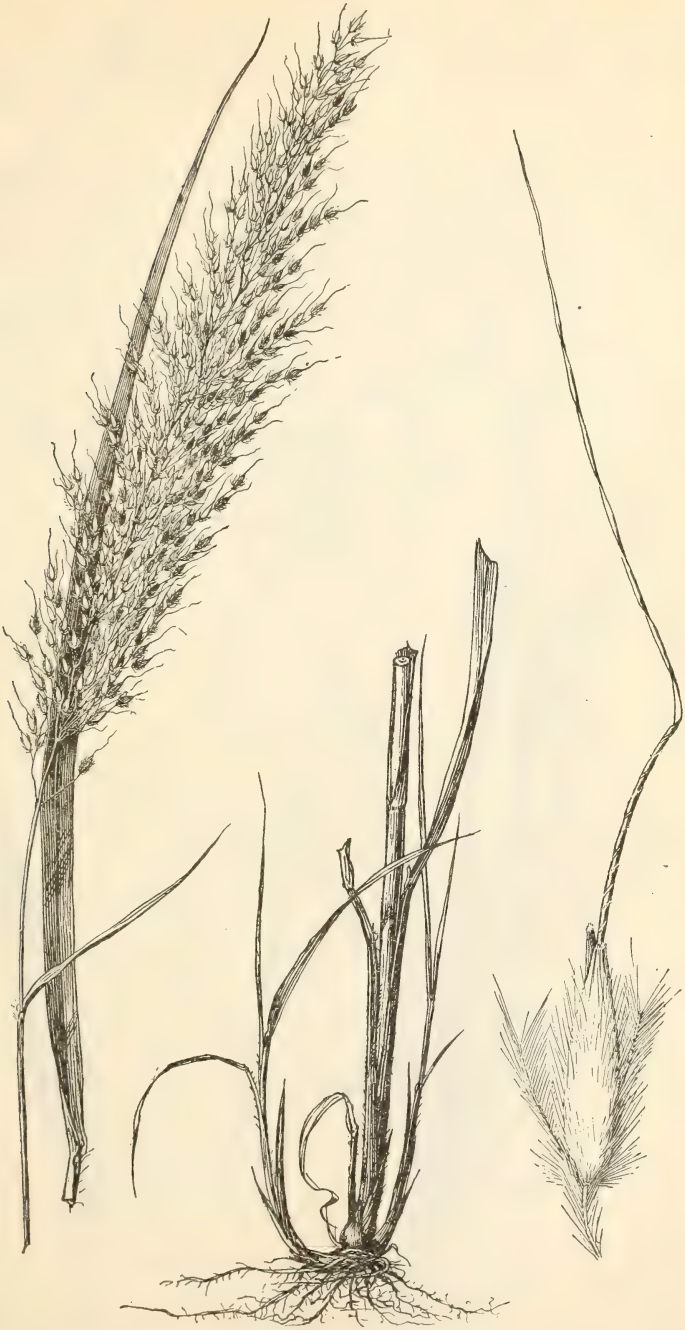

FIG. 163.—Indian grass, *Sorghastrum nutans*. Plant, × ½; spikelet with pedicel at left and rachis joint at right, × 5.

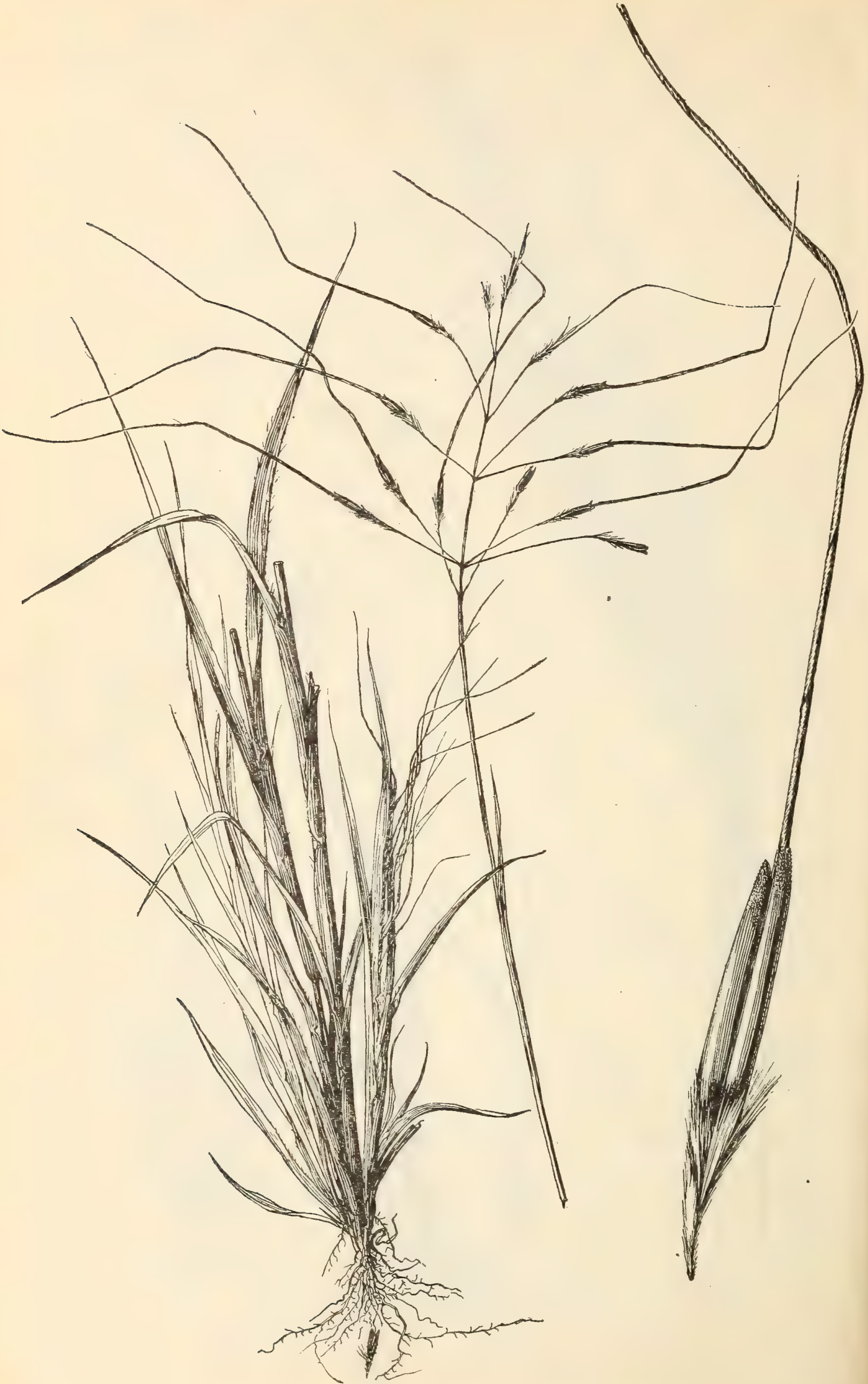

FIG. 164.—*Rhaphis pauciflora.* Plant with old spikelet still attached to roots, × ½; fruiting fertile spikelet, × 5.

much shorter than the very thin sterile and fertile lemmas. The awn is about 6 inches long, twisted and bent. The species before maturity furnishes forage on the grassy pinelands of southern Florida.

136. HETEROPOGON Pers.

Spikelets in pairs, one sessile, the other pedicellate, both of the lower few to several pairs staminate or neuter, the remainder of the sessile spikelets perfect, terete, long-awned, the pedicellate spikelets, like the lower, staminate, flat, conspicuous, awnless; glumes of the fertile spikelet equal, coriaceous, the first brown-hirsute, infolding the second; lemmas thin and hyaline, the fertile one narrow, extending into a strong bent and twisted brown awn; palea wanting; glumes of the staminate spikelet membranaceous, the first green, faintly many nerved, asymmetric, one submarginal keel rather broadly winged, the other wingless, the margins inflexed, the second glume narrower, symmetric; lemmas hyaline; palea wanting.

Annual or perennial, often robust grasses, with flat blades and solitary racemes terminal on the culms and branches; rachis slender, the lower part, bearing the pairs of staminate spikelets, continuous, the remainder disarticulating obliquely at the base of each joint, the joint forming a sharp barbed callus below the fertile spikelet, the pedicellate spikelet readily falling, its pedicel remaining, obscured in the hairs of the callus. Species about seven, in the warmer regions of both hemispheres; two in the United States, from Florida to Arizona.

Type species: *Heteropogon glaber* Pers.

Heteropogon Pers., Syn. Pl. 2: 533. 1807. Persoon describes two species, *H. glaber*, of which he gives as synonyms *Andropogon allioni* DC. and *A. contortus* All., and *H. hirtus*, of which he gives as a synonym *Andropogon contortus* L. The first is selected as the type.

Spirotheros Raf., Bull. Bot. Seringe 1: 221. 1830. A single species, "*Stipa melanocarpa* Muhl., *Andropogon melanocarpus* Ell.," is given.

The two species in the United States are *Heteropogon contortus* (L.) Beauv. (fig. 165), a perennial, 1 to 3 feet tall, the first glume of the staminate spikelets papillose-pilose, sometimes sparsely so, and *H. melanocarpus* (Ell.) Benth., an annual, 4 to 7 feet tall and often much branched, the first glume of the staminate spikelets bearing a row of glands along the back. The first species is found in rocky places from Texas to Arizona. The second is found in Florida, Georgia, and Alabama; also in Arizona. The oil glands on the inflorescence of the latter give the plant an odor like that of citronella oil.

Heteropogon contortus is an important forage grass but does not extend far into the United States. In the Hawaiian Islands, where it is called pili, it is an important range grass on the drier areas. It was used by the natives to thatch their grass huts. The mature fruits are injurious to sheep.

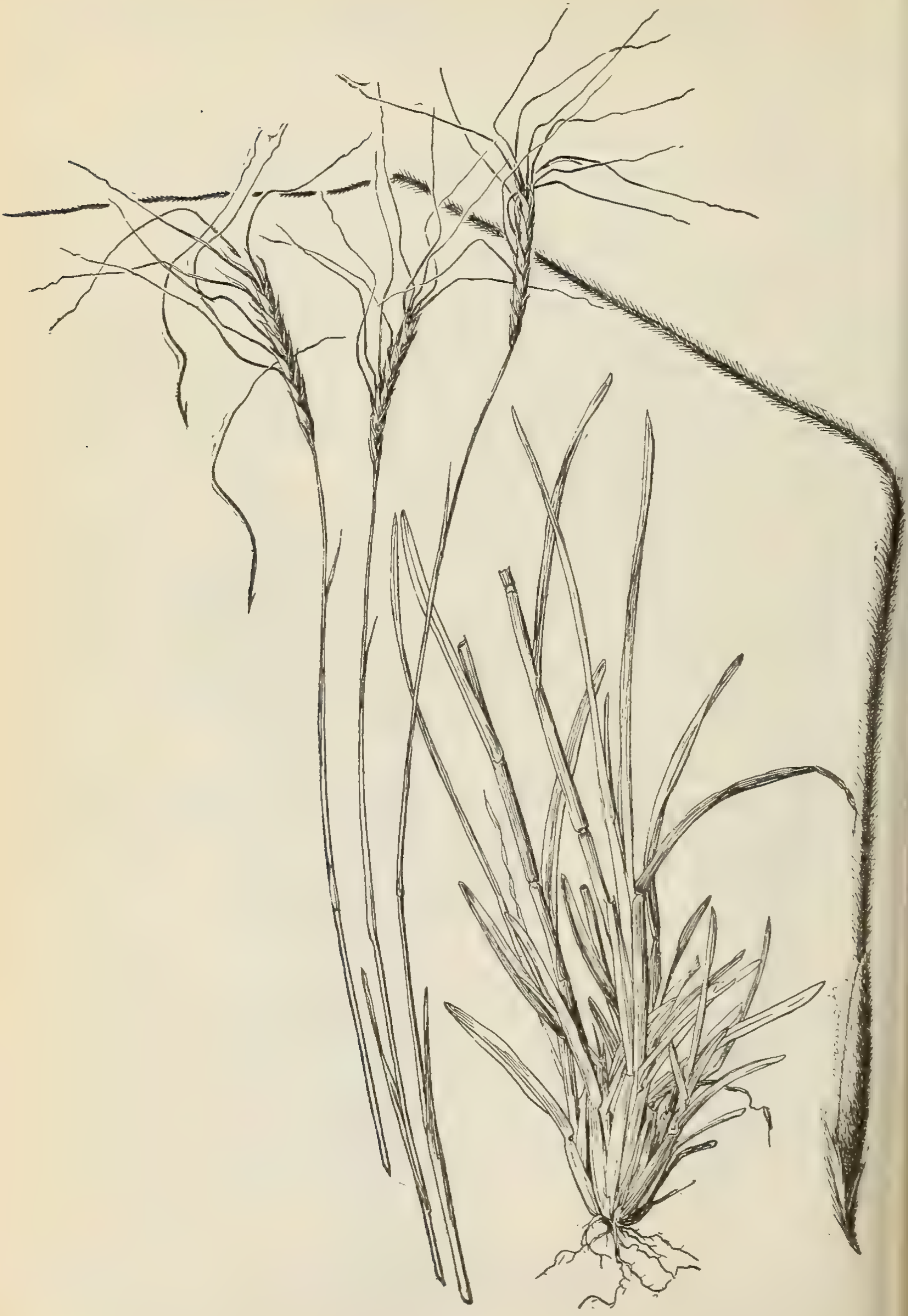

FIG. 165.—*Heteropogon contortus.* Plant, × ½; fruiting fertile spikelet, × 5.

137. TRACHYPOGON Nees.

Spikelets in pairs, along a slender continuous rachis, one nearly sessile, staminate, awnless, the other pedicellate, perfect, long-awned; the pedicel of the perfect spikelet obliquely disarticulating near the base, forming a sharp barbed callus below the spikelet; first glume firm-membranaceous, rounded on the back, several-nerved, obtuse; second glume firm, obscurely nerved; fertile lemma narrow, extending into a stout twisted and bent or flexuous awn; palea obsolete; sessile spikelet persistent, as large as the fertile spikelet and similar but awnless.

Perennial, moderately tall grasses, with terminal spikelike racemes, these single or clustered. Species about seven, Mexico to South America, one extending into the southwestern United States.

Type species: *Andropogon montufari* H. B. K.

Trachypogon Nees, Agrost. Bras. 341. 1829. The first of the 13 species described, *T. montufari*, based on *Andropogon montufari*, is selected as the type. The first five species are all that are now retained in Trachypogon.

Our only species is *Trachypogon montufari* (H. B. K.) Nees (fig. 166), found in southern Arizona and southwestern New Mexico, an erect slender perennial with solitary racemes, the feathery awns about 1½ inches long. It is an important constituent of the grazing areas of Central and South America.

138. ELYONURUS Humb. and Bonpl.

Spikelets in pairs along a somewhat tardily disarticulating rachis, the joints and pedicels thickened and parallel, the sessile spikelets appressed to the concave side, the pedicellate spikelet staminate, similar to the sessile one, both awnless, the pair falling with a joint of the rachis; first glume firm, somewhat coriaceous, depressed on the back, the margins inflexed around the second glume, a line of balsam glands on the marginal nerves, the apex entire and acute or acuminate, or bifid with aristate teeth; second glume similar to the first; sterile and fertile lemmas thin and hyaline; palea obsolete.

Erect, moderately tall perennials, with solitary spikelike, often woolly racemes. Species about 15, in the warmer regions of both hemispheres; two species extending into our Southern States.

Type species: *Elyonurus tripsacoides* Humb. and Bonpl.

Elyonurus Humb. and Bonpl., Willd. Spec. Pl. **4**: 941. 1806. Only one species is described.

Elyonurus tripsacoides (fig. 167), with inconspicuously hairy spikes, extends from Florida to Texas, and *E. barbiculmis* Hack., with conspicuously woolly spikes, is found from western Texas to Arizona. The species of Elyonurus are important grazing grasses in the savannas and plains of tropical America.

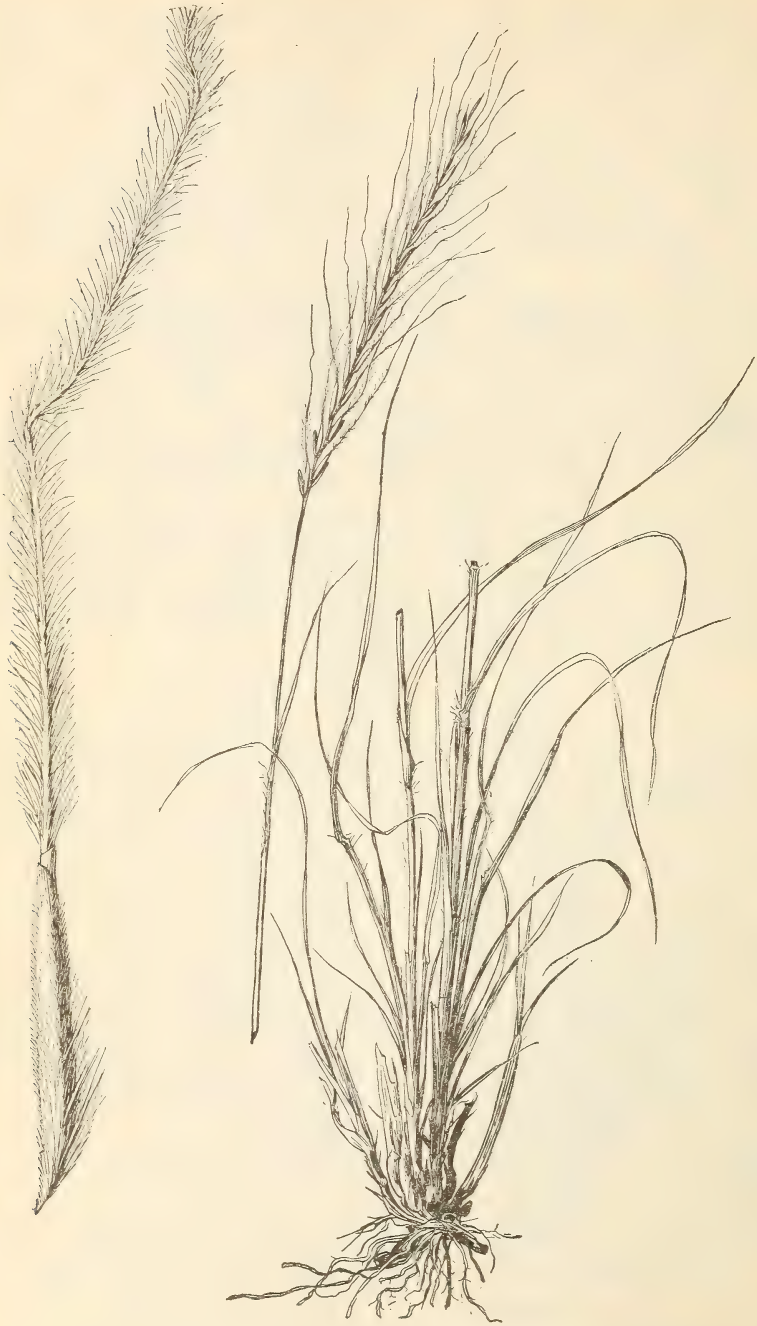

FIG. 166.—*Trachypogon montufari.* Plant, × ½; fruiting fertile spikelet, × 5.

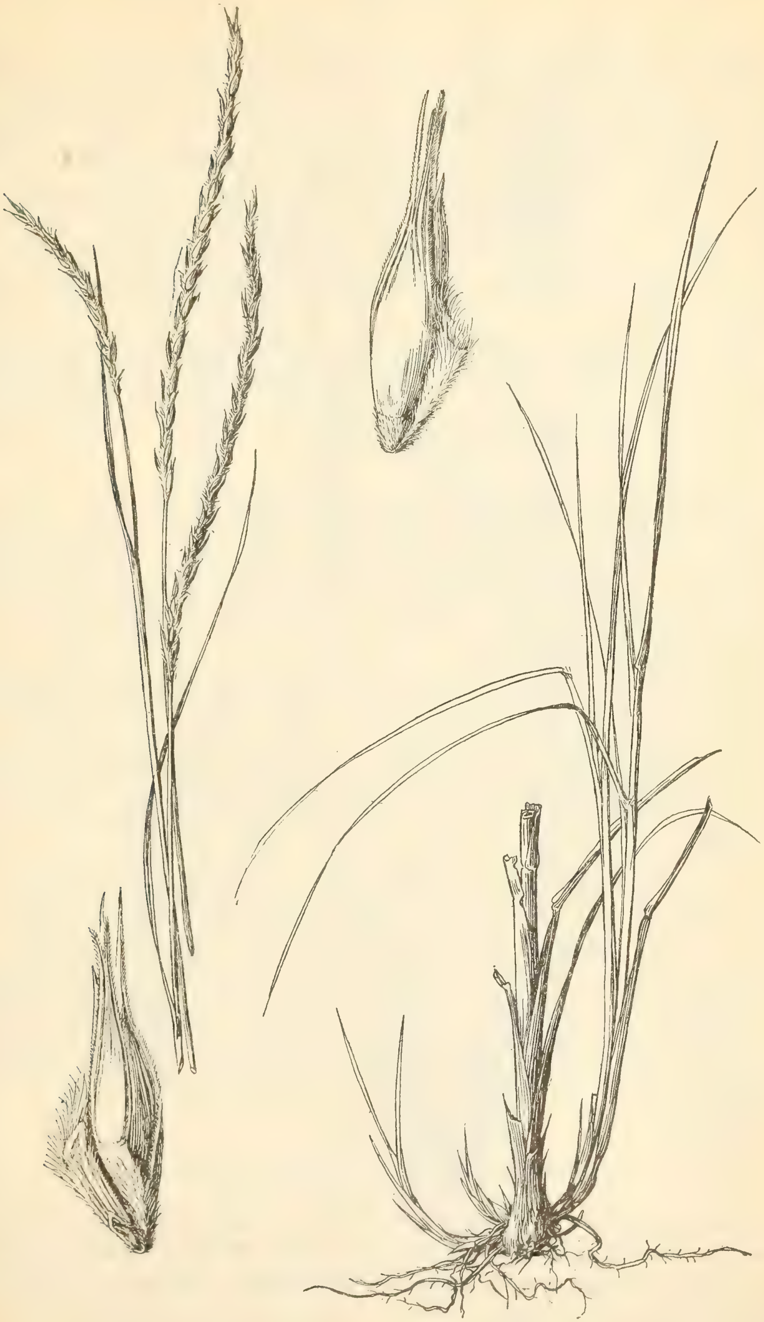

FIG. 167.—*Elyonurus tripsacoides.* Plant, × ½; two views of a pair of spikelets with a joint of the rachis, × 5.

139. MANISURIS L.

(*Rottboellia* L. f.)

Spikelets awnless, in pairs at the nodes of a thickened articulate rachis, one sessile and fertile, the other pedicellate and sterile, the pedicel thickened and appressed to the rachis, the sessile spikelet fitting closely against the rachis, forming a cylindric or subcylindric spike; glumes obtuse, awnless, the first coriaceous, fitting over the hollow containing the spikelet, the second less coriaceous than the first; sterile lemma, fertile lemma, and palea thin and hyaline, inclosed within the glumes; pedicellate spikelet reduced, often rudimentary.

Perennial slender, moderately tall, or tall grasses, with usually numerous smooth cylindric or flattened spikes, single on the culms and branches. Species about 30, in the warm regions of both hemispheres; 5 in the southern United States.

Type species: *Manisuris myuros* L.

Manisuris L., Mant. Pl. 2: 164. 1771. Only one species described.

Rottboellia L. f., Nov. Gram. Gen. 22, pl. 1, 1779 (Amoen, Acad. 10. 1790), not Scop., 1777. In a note appended to the description of the genus is the statement, "Huc pertinent Aegilops Incurvata & Exaltata S. N., p. 762, aeque ac Panicum Dimidiatum S. N., p. 90." The second species, being the one illustrated, is the type.

Stegosia Lour., Fl. Cochinch. 1: 51. 1790. Type, *S. cochinchinensis* Lour., the only species described.

Hemarthria R. Br., Prodr. Fl. Nov. Holl. 207. 1810. Two species described, *H. compressa* and *H. uncinata*. The first species, based upon *Rottboellia compressa* L. f., is chosen as the type.

Lodicularia Beauv., Ess. Agrost. 108, pl. 21, f. 6. 1812. A single species is included, *L. fasciculata*, based on *Rottboellia fasciculata* Desf. (*R. fasciculata* Lam. evidently intended).

Coelorhachis Brongn., in Duperr. Bot. Voy. Coquille 64. 1829. The type is *Aegilops muricata* Retz., on which is based *Coelorhachis muricata*, the only species described.

The species of Manisuris found in the United States are nowhere abundant and are of little economic importance, though they may furnish some forage. *Manisuris fasciculata* (Lam.) Hitchc. has flattened spikes. The other three species have cylindric spikes. In these the first glume is variously marked, being somewhat pitted in *M. cylindrica* (Michx.) Kuntze (fig. 168), tessellate in *M. tessellata* (Steud.) Scribn., and transversely wrinkled in *M. rugosa* (Nutt.) Kuntze.

140. RYTILIX Raf.

(*Hackelochloa* Kuntze, *Manisuris* of authors.)

Spikelets awnless, in pairs, the rachis joint and pedicel grown together, the two clasped between the edges of the globose alveolate first glume of the sessile spikelet; pedicellate spikelet conspicuous, staminate.

A much-branched annual with flat blades, the numerous spikes single and more or less inclosed in the sheathing bract, these some-

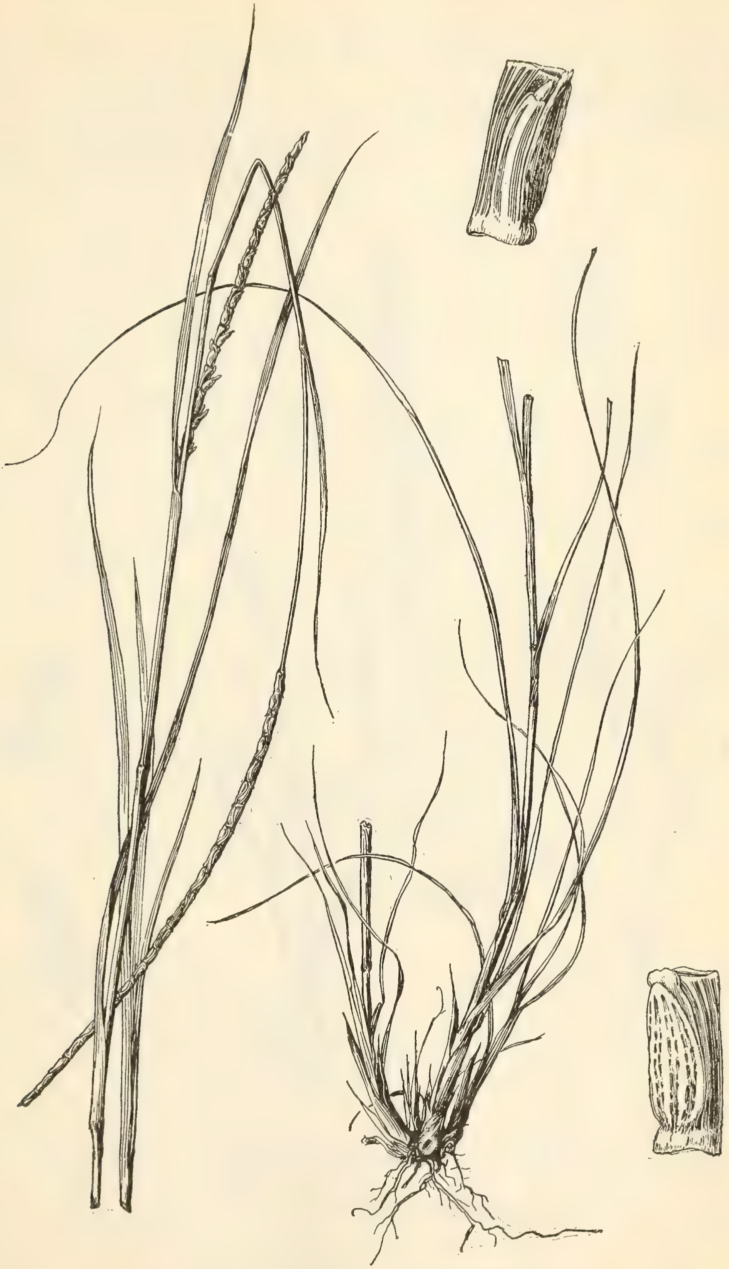

FIG. 168.—*Manisuris cylindrica.* Plant, × ½; sessile spikelet and joint of rachis, × 5; joint of rachis with sterile pedicel and rudimentary spikelet, the fertile spikelet at right, × 5.

what clustered in the axils of the foliage leaves. Species one, in the tropical regions of the world.

Type species: *Manisuris granularis* Swartz.

Rytilix Raf., Bull. Bot. Seringe **1**: 219. 1830. Rafinesque cites "Manisuris granularis et Myurus Auct." and lists one species *Rytilix glandulosa*. The first species cited is chosen as the type.

Hackelochloa Kuntze, Rev. Gen. Pl. **2**: 776. 1891. Kuntze restores Manisuris to its Linnæan sense and, overlooking Rytilix Raf., proposes Hackelochloa for Manisuris Swartz, with *H. granularis*, based on *Cenchrus granularis*, as the type.

Rytilix granularis (L.) Skeels (fig. 169) is a tropical weed which extends into the United States from Florida to Arizona. The little pitted globose spikelets are very characteristic.

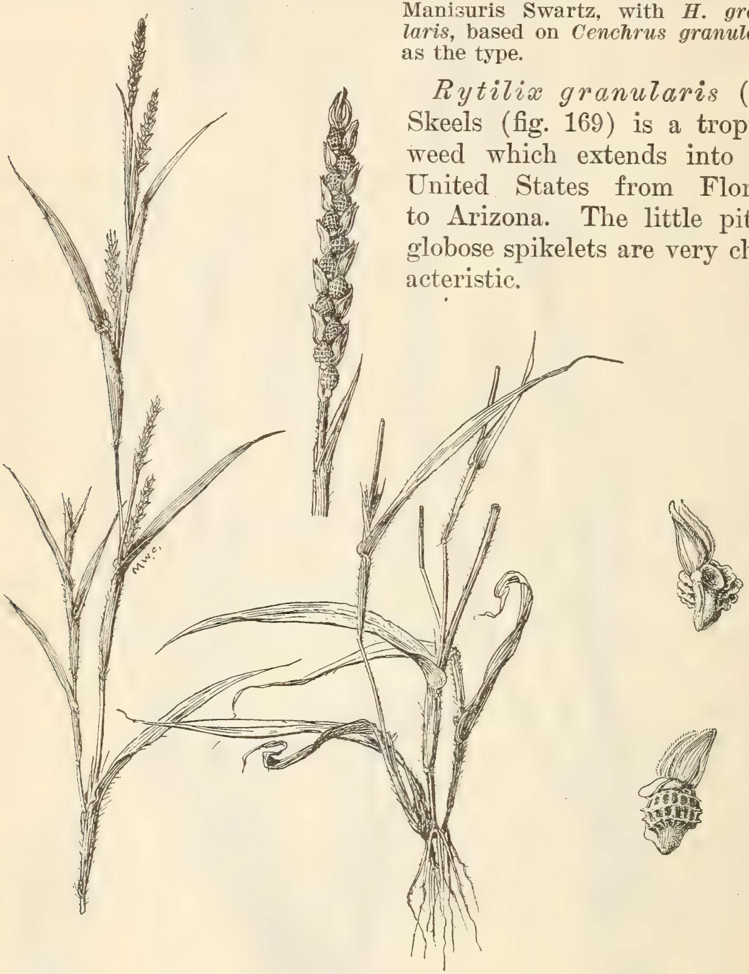

Fig. 169.—*Rytilix granularis.* Plant, × ½; a single raceme, × 2; two views of a pair of spikelets with joint of rachis and pedicel grown together, × 5.

14. TRIPSACEAE, THE CORN TRIBE.

141. Tripsacum L.

Spikelets unisexual; staminate spikelets 2-flowered, in pairs on one side of a continuous rachis, one sessile, the other sessile or pedicellate, similar to those of Zea, the glumes firmer; pistillate spikelets single and on opposite sides at each joint of the thick, hard articulate lower part of the same rachis, sunken in hollows in the joints, consisting of one perfect floret and a sterile lemma; first glume coriaceous, nearly infolding the spikelet, fitting into and closing the hollow of the rachis; second glume similar to the first but smaller, infolding the remainder of the spikelet; sterile lemma, fertile lemma, and palea very thin and hyaline, these progressively smaller.

Robust perennial grasses, with usually broad flat blades and monœcious terminal and axillary inflorescences of 1 to 3 spikes, the pistillate part below, breaking up into bony, seedlike joints, the staminate above on the same rachis, deciduous as a whole. Species about seven, all American, extending from the middle United States to northern South America; three species in the United States.

Type species: *Coix dactyloides* L.

Tripsacum L., Syst. Nat., ed. 10, 2: 1261. 1759. Type the first of the two species described, *T. dactyloides*, based on *Coix dactyloides* L., and *T. hermaphroditum.* The second species, based on "Cenchrus 2, Brown. Jam. 367," is now referred to Anthephora.

Dactylodes Zanoni-Monti; Kuntze, Rev. Gen. Pl. 2: 772. 1891. Two species are included, *D. angulatum*, based on *Coix angulatus* Mill., and *D. fasciculatum*, based on *Tripsacum fasciculatum* Trin. *Coix angulatus*, which is the same as *Tripsacum dactyloides*, is taken as the type.

The common species in the United States is *Tripsacum dactyloides* (Pl. XX; fig. 170), a robust perennial, 3 to 6 feet tall, with broad blades, the terminal spikes mostly in threes, the axillary spikes mostly solitary. This species, called gama grass, is found in moist places from Connecticut to Texas and Florida. It is a good forage grass, but is usually not abundant enough to be of much importance. A second species, *T. floridanum* Porter, with narrow blades, is found in southern Florida, and a third species, *T. lemmoni* Vasey, with pilose lower sheaths, is found in Arizona.

142. EUCHLAENA Schrad.

Staminate spikelets as in Zea; pistillate spikelets single, on opposite sides, sunken in cavities in the hardened joints of an obliquely articulate rachis, the indurate first glume covering the cavity; second glume membranaceous, the lemmas hyaline. Spikes infolded in foliaceous bracts or husks, 2 to several of these together inclosed in the leaf sheaths.

The one species generally recognized is *Euchlaena mexicana* Schrad., a tall annual with somewhat the aspect of corn (*Zea mays*), a native of Mexico.

Type species: *Euchlaena mexicana* Schrad.

Euchlaena Schrad., Ind. Sem. Hort. Goettingen. 1832. Only one species described. The specimen was collected by Dr. Mühlenfordt in Mexico.

The genus is little known. Several species have been proposed, but they are doubtfully distinct from *Euchlaena mexicana*. An un-

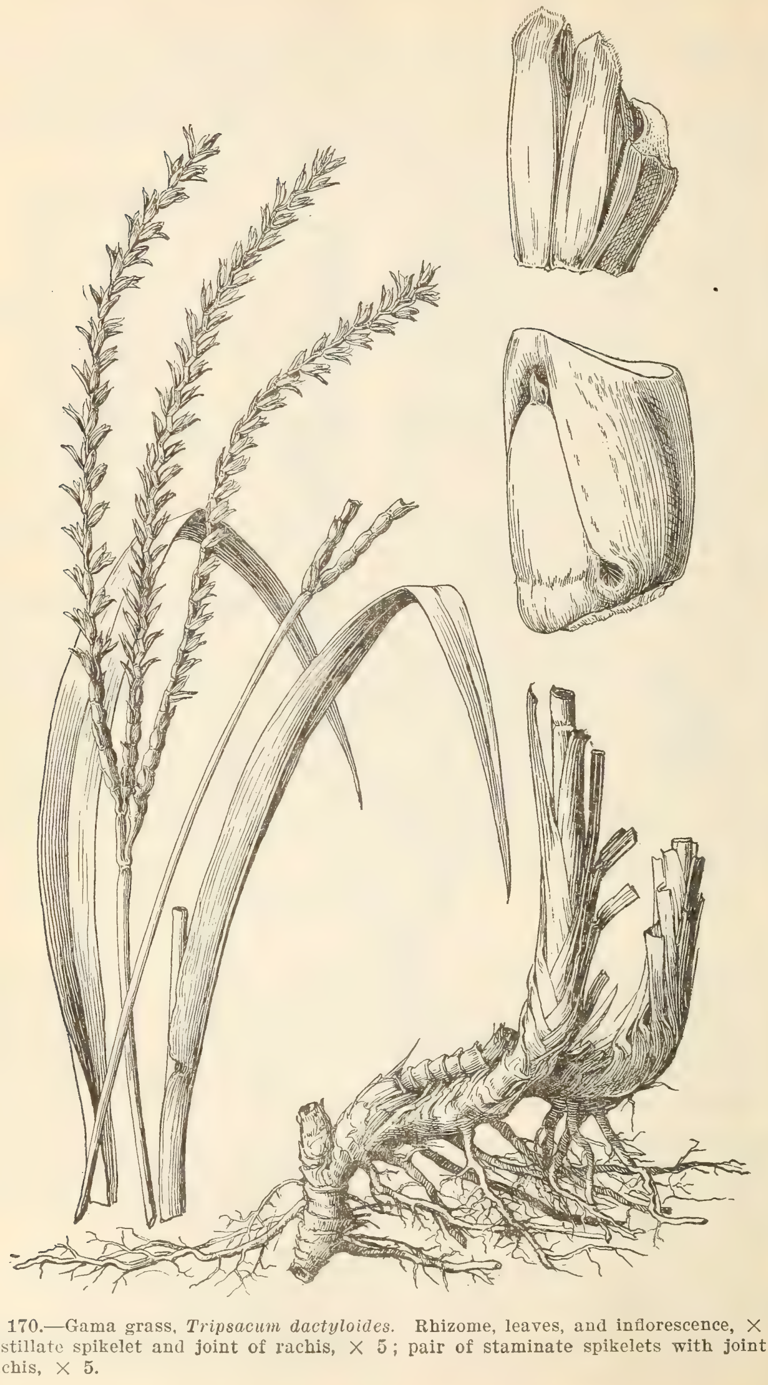

FIG. 170.—Gama grass, *Tripsacum dactyloides.* Rhizome, leaves, and inflorescence, × ½; pistillate spikelet and joint of rachis, × 5; pair of staminate spikelets with joint of rachis, × 5.

described species from Mexico is a perennial with simple culms and creeping rhizomes. A form which is supposed to be the original *E. mexicana* is cultivated occasionally in our Southern States, where it is known as teosinte (fig. 171). This is a tall, stout grass, usually branching at the base and forming large clumps. The tassel is like that of corn, and the fascicles of spikes, inclosed in husks with the long styles or silk hanging from the apex, bear a superficial resemblance to the ears of corn. Teosinte is cultivated chiefly for soiling. It has sometimes been called *Reana luxurians* Durieu.

143. Zea L., maize, Indian corn.

Spikelets unisexual; staminate spikelets 2-flowered, in pairs, on one side of a continuous rachis, one nearly sessile, the other pedicellate; glumes membranaceous, acute; lemma and palea hyaline; pistillate spikelets sessile, in pairs, consisting of one fertile floret and one sterile floret, the latter sometimes developed as a second fertile floret; glumes broad, rounded or emarginate at apex; sterile lemma similar to the fertile, the palea present; style very long and slender, stigmatic along both sides well toward the base.

A tall annual grass, with broad, conspicuously distichous blades, monœcious inflorescences, the staminate flowers in spikelike racemes, these numerous, forming large spreading panicles (tassels) terminating the stems, the pistillate inflorescence in the axils of the leaves, the spikelets in 8 to 16 or even as many as 30 rows on a thickened, almost woody axis (cob), the whole inclosed in numerous large foliaceous bracts (husks), the long styles (silk) protruding from the top as a silky mass of threads. In the common varieties of corn the floral bracts are much shorter than the kernel and remain on the cob when the kernels are shelled.[1] Species one.

Type species: *Zea mays* L.

Zea L., Sp. Pl. 971, 1753; Gen. Pl., ed. 5, 419. 1754. *Zea mays* is the only species described.

Mays Tourn., in Gaertn. Fruct. and Sem. 1: 6, pl. 1. 1788. The single species, *M. zea* Gaertn., is the same as *Zea mays* L.

Mayzea Raf., Med. Fl. 2: 241. 1830. Two species included. *Zea mays* L., on which the first species, *M. cerealis*, is based, is taken as the type.

In the United States *Zea mays* L. (figs. 172, 173) is usually called corn; in Europe and sometimes in America, especially in literature, it is called maize. Corn is one of the important economic plants of the world, being cultivated for food for man and domestic animals and for forage. It originated[2] in America, probably on the Mexican Plateau, and was cultivated from prehistoric times by the early

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[1] For note on the structure of the maize ear as indicated in Zea-Euchlaena hybrids, see Collins, Journ. Agr. Res. 17: 127–135. 1919.

[2] For a note on the origin of maize, see Collins, Journ. Washington Acad. Sci. 2: 520. 1912.

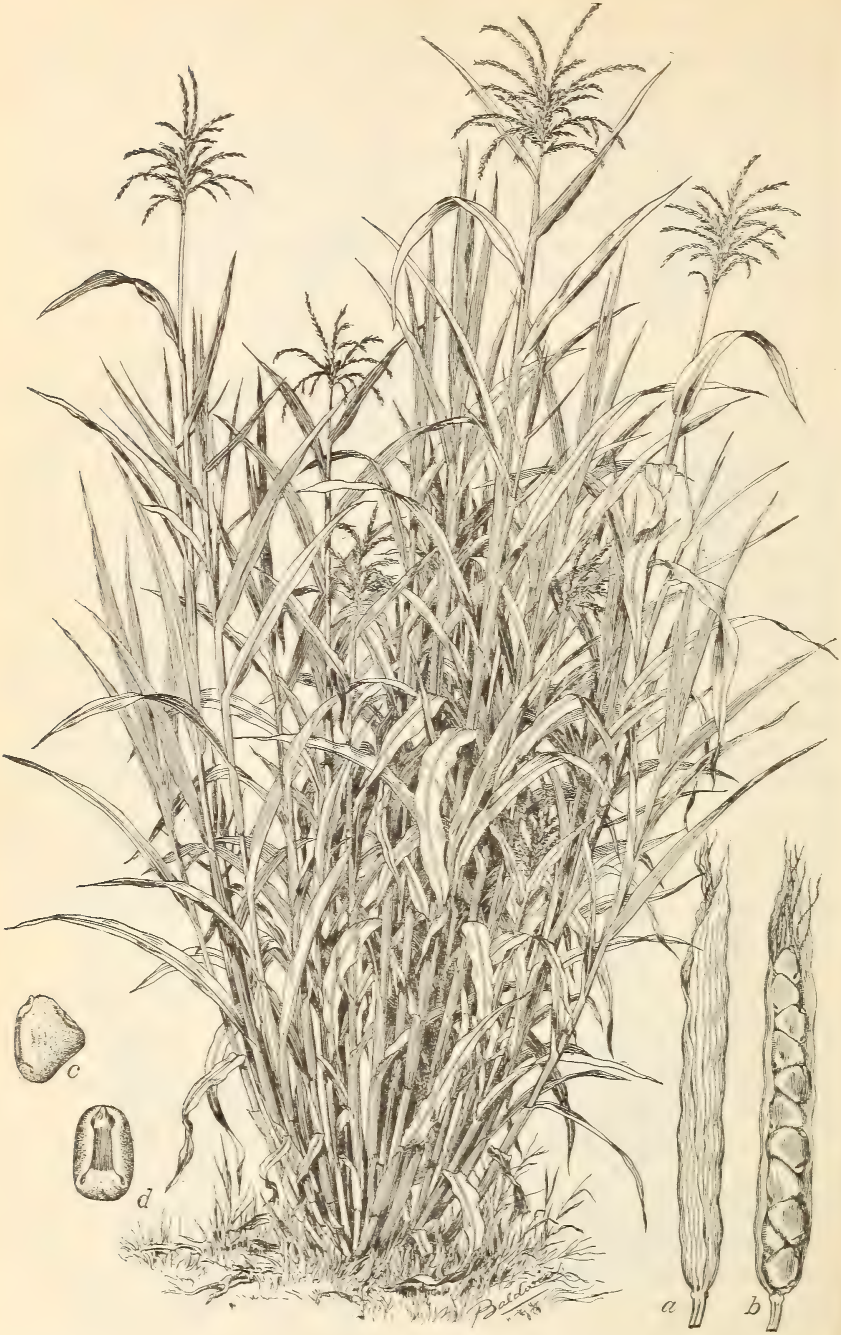

FIG. 171.—Teosinte, *Euchlaena mexicana*. Sketch of plant, much reduced; pistillate inflorescence inclosed in bract (*a*) and with portion of bract removed (*b*), × 1; lateral view of joint of rachis and the fertile spikelet (*c*), × 2; dorsal view of same, showing first glume (*d*), × 2.

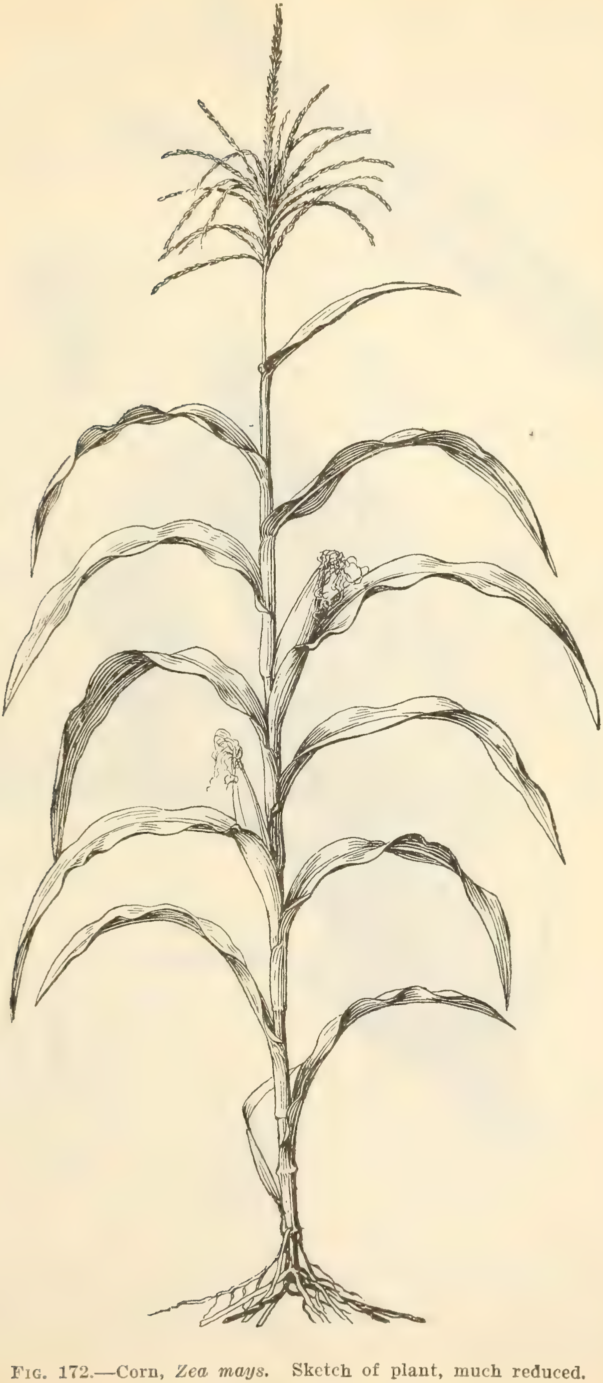

Fig. 172.—Corn, *Zea mays*. Sketch of plant, much reduced.

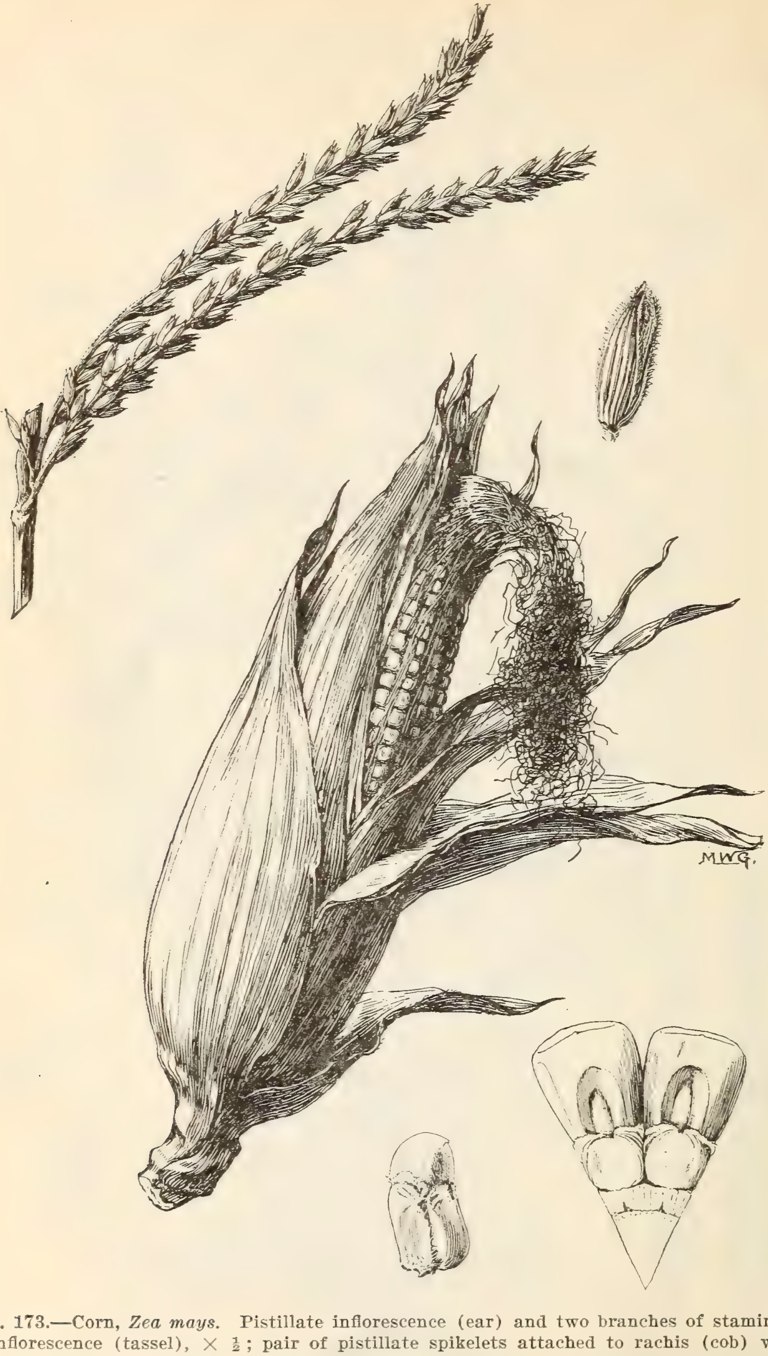

FIG. 173.—Corn, *Zea mays.* Pistillate inflorescence (ear) and two branches of staminate inflorescence (tassel), × ½; pair of pistillate spikelets attached to rachis (cob) with mature caryopses (grains), the second glume showing, × 2; single pistillate spikelet soon after flowering showing first (at left) and second glumes and young grain, × 2; staminate spikelet, × 2.

races of American aborigines, from Peru to middle North America. Several races of corn are grown in the United States,[1] the most important being dent, the common commercial field sort, flint, sweet, and pop. Pod corn (*Z. mays tunicata* Larr.), occasionally cultivated as a curiosity, is a variety in which each kernel is enveloped in the elongate floral bracts. A variety with variegated leaves (*Z. mays japonica* Körn.) is cultivated for ornament.

144. Coix L.

Spikelets unisexual; staminate spikelets 2-flowered, in twos or threes on the continuous rachis, the normal group consisting of a pair of sessile spikelets with a single pedicellate spikelet between, the latter sometimes reduced to a pedicel or wanting; glumes membranaceous, obscurely nerved; lemma hyaline, nearly as long as the glumes, awnless, 5-nerved; palea hyaline, a little shorter than the lemma; stamens 3; pistillate spikelets 3 together, 1 fertile and 2 sterile at the base of the inflorescence; fertile spikelet consisting of 2 glumes, 1 sterile lemma, a fertile lemma, and a palea; glumes several-nerved, hyaline below chartaceous in the upper narrow pointed part, the first very broad, infolding the spikelet, the margins infolded beyond the 2 lateral stronger pair of nerves, the second glume narrower than the first, keeled; sterile lemma about as long as the second glume, similar in shape but a little narrower, hyaline below, somewhat chartaceous above; fertile lemma hyaline, narrow, somewhat shorter than the sterile lemma; palea hyaline; narrow, shorter than the lemma; sterile spikelets consisting of a single narrow tubular glume as long as the fertile spikelet, somewhat chartaceous.

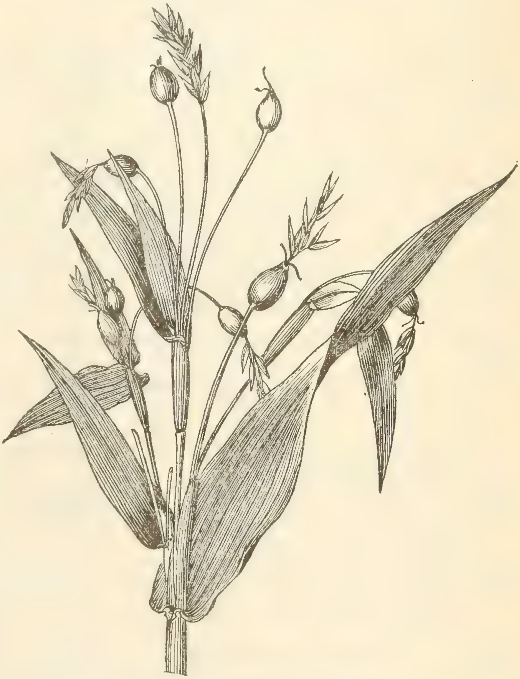

Fig. 174.—Job's-tears, *Coix lachryma-jobi.* Upper portion of plant, × 1.

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[1] See Montgomery, The Corn Crops, 15, 1913: Sturtevant, U. S. Dept. Agr., Off. Exp. Sta. Bull. 57. 1899.

Tall branched grasses with broad flat blades, the monœcious inflorescences numerous on long, stout peduncles, these clustered in the axils of the leaves, each inflorescence consisting of an ovate or oval, pearly white or drab, beadlike, very hard, tardily deciduous involucre (much modified sheathing bract) containing the pistillate lower portion of the inflorescence, the points of the pistillate spikelets and the slender axis of the staminate portion of the inflorescence protruding through the orifice at the apex, the staminate upper portion of the inflorescence 2 to 4 cm. long, soon deciduous, consisting of several clusters of staminate spikelets. Species about four, one widely distributed in tropical countries, the others in the East Indies.

Type species: *Coix lachryma-jobi* L.

Coix L., Sp. Pl. 972, 1753; Gen. Pl., ed. 5, 419. 1754. Linnæus describes two species, *C. lachryma-jobi* and *C. dactyloides.* The reference in the Genera Plantarum (above cited) is to Tournefort's plate 302, which represents the first species.

Coix lachryma-jobi L. (fig. 174), known as Job's-tears and sometimes as Christ's-tears, is cultivated in all tropical countries for ornament and has escaped into waste places, especially around dwellings. It is also cultivated in greenhouses and sometimes in the open in warm temperate regions. The name Job's-tears comes from the fancied resemblance of the fruit to tears. The fruits, or so-called seeds, are used for a variety of purposes, such as beads, and for rosaries.

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